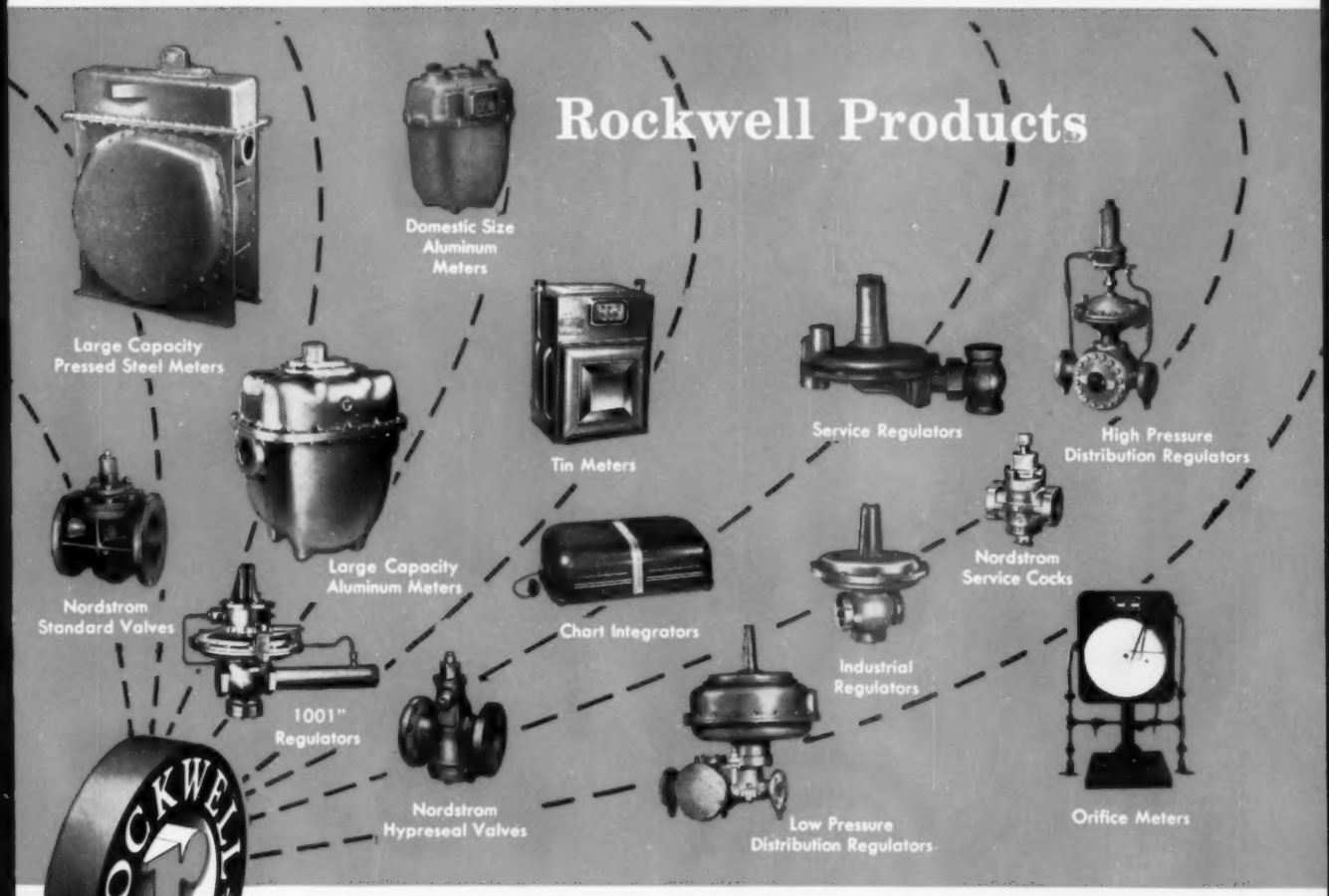
MAY 1957

GAS

GAS INDUSTRY BUDGETS TOP $2 BILLION FOR FIRST TIME

A CHILTON PUBLICATION

ENGINEERING • UTILIZATION • PIPELINES • MANAGEMENT

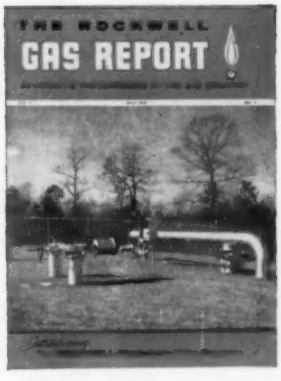


IN THIS ISSUE

THE ROCKWELL GAS REPORT

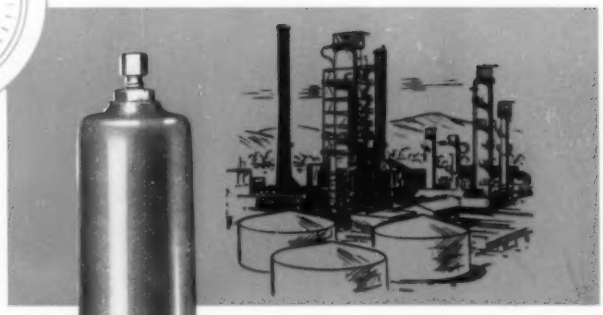
Introducing the Rockwell-Nordstrom Valve-Regulator

Edited and produced for the management and operating group of the gas industry by Rockwell Manufacturing Company, Pittsburgh 8, Pa.



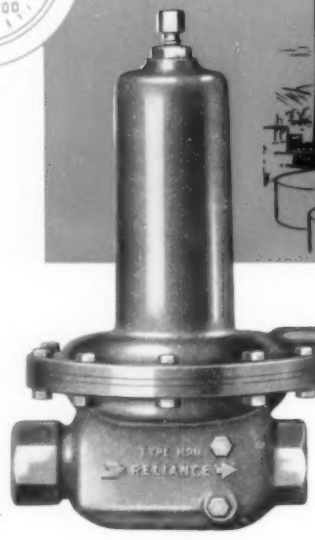
TURN TO PAGES 21 TO 24 IN THIS ISSUE

TURN TO PAGES 21 TO 24 IN



These two RELIANCE High-Pressure Gas Regulators are used by several different industries. From the largest refinery to small industrial plants, they are always on the job, reducing high gas pressures to a low, steady flow of gas that can be utilized to the best advantage.

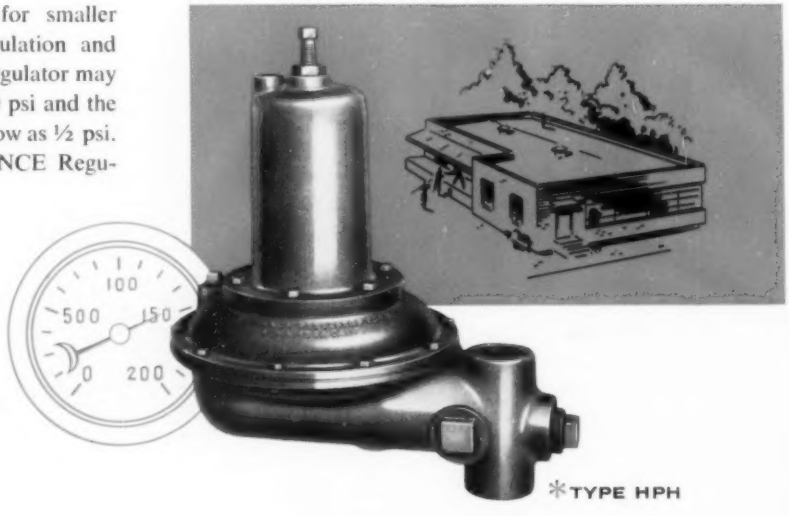
TYPE **HPR*** is available in several models which allow inlet pressures up to 1000 psi (2000 psi in bronze) and reduce them to as low as 2½ psi. This wide pressure range, plus compact, rugged construction, make this Regulator a natural for farm taps, general gasoline plant and refinery installation, and for controlling any high pressure gases.



*TYPE HPR

Silent Masters OF HIGH PRESSURE GAS

TYPE **HPH*** is recommended for smaller industrial plants where sensitive regulation and positive lock-up are required. This Regulator may be used with inlet pressures up to 150 psi and the outlet pressures may be reduced to as low as ½ psi. *Throughout general industry* RELIANCE Regulators MAKE GAS BEHAVE.



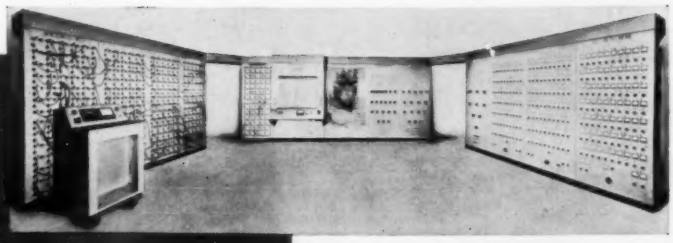
*TYPE HPH

BULLETINS ARE AVAILABLE ON ALL TYPES OF **RELIANCE REGULATORS**

AMERICAN® METER COMPANY
INCORPORATED (ESTABLISHED 1836)

AMERICAN METER CO EST. 1836 MEASUREMENT ENGINEERS

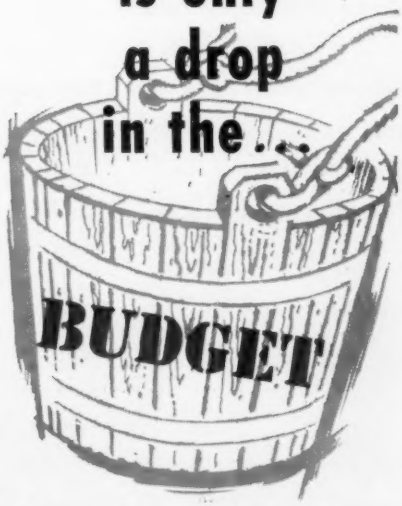
RELIANCE REGULATOR DIVISION
ALHAMBRA, CALIFORNIA



When You Spend Millions

TO KEEP PACE WITH THE GROWTH AND PROGRESS OF A METROPOLITAN AREA . . .

The Cost of a McILROY FLUID NETWORK ANALYZER is only a drop in the . . .



THE KIPLINGER WASHINGTON LETTER of Dec. 22, 1956 says:—

"Total population of the U. S. grows so fast you lose track of it. 40 years ago, 100,000,000. 10 years ago, 141,000,000. NOW 170,000,000. By 1975, 221,000,000 . . . and that's a lot of people to be fed, clothed, housed, and otherwise serviced . . . potential customers within our system."

THE NEW, DYNAMIC AMERICA IS HERE

Automation, nuclear power, man-made satellites are no longer a dream and five-year plans become obsolete overnight. To meet this huge, dynamic growth in population

ADEQUATE DISTRIBUTION BY UTILITIES DEMANDS LONG RANGE PLANS

To THE GAS INDUSTRY this means that during the lifetime of a McIlroy Analyzer distribution facilities in many cases must be more than doubled — involving endless surveys, analyses, plans construction and equipment . . .

ALL COSTING MILLIONS IN MONEY!

To spend far ahead, you must be able to see far ahead. And that is the Analyzer's job — to help you look before you leap. With amazing speed, and extremely low final cost the McIlroy checks the validity of each step in your proposed program *before* you spend a cent.

With a McIlroy Analyzer you can not only *pre-test* your long range plans for network expansion but analyze your immediate day-to-day problems. Think how this can prevent disastrous waste of engineering and construction time, of materials and labor that can easily run into millions!

Let us send you a list of McIlroy users

That's why we say **the cost of a McIlroy is only a drop in any budget**

The STANDARD ELECTRIC TIME COMPANY

125 Logan Street
Springfield 2
Massachusetts

Contents • May 1957

33RD YEAR OF PUBLICATION • VOLUME XXXIII • NUMBER 5

GAS

FEATURES

GAS 10th annual construction survey 51
Record sums will be spent to meet demands for more gas 52
Distribution companies increase 1957 budgets 28% over 1956 53
Pipeline companies plan to build 10,040 miles of new line in '57 56
Design your city gate stations for the future 67
By Carroll V. Kroeger
Practical aspects of analysis with an electronic computer ... 73
By G. G. Wilson, D. V. Kniebes, and R. T. Ellington
Customer-sponsored research 80
By R. C. Le May
Canadian companies to spend $359.9 million this year 85
How Philadelphia Gas Works detects defective meters 86
By Robert J. Ott
Package kitchens feature all-gas equipment 90

PIPELINE SECTION

Westcoast Transmission—Opening the Canadian natural gas frontier 127
By J. Fred Ebdon
Gas well analysis with portable testing unit 141
By Ken Kridner
Automatic welding speeds Canadian line 160
Reserves up 14.1 trillion cu ft in '56 for biggest recorded gain 170

DEPARTMENTS

Editorial Comment—

Thermally Thinking, *by J. Fred Ebdon* 6
Highlights 8
Regulatory and Legislative Trends 11
Washington, *by Neil Regeimbal* 17
Technical Trends, *by Guy Corfield* 19
Corrosion Prevention, *by Marshall E. Parker*. 27
Communications, *by Frank Chapman* ... 153

News Developments—

Man-made environment effects to be studied .. 92
New rate-making procedures studied in Ohio. 94
New barge designed for off-shore pipelaying .. 171
New gas well pipe developed in France 174
Am-La trims 40 MMcf from 100 MMcf program 182

Departments—

Calendar 100
People 102
Associations 109
Digest of New Products and Trade Literature. 112
Progress reports 158
Pipeline People 196
Advertisers' Index 198

GAS is published monthly. Copyright 1957 by Chilton Company, 56th and Chestnut Streets, Philadelphia 39, Pa. Subscription price: United States and possessions and Canada (in advance): one year, $2.00; two years, $3.00. Mexico, South and Central America, Caribbean Area: one year, $3.00; two years, $5.00. All other countries: $10 per year.
Accepted under Section 34.64 P.L.&R. authorized. Members: Business Publications Audit of Circulation, Inc., National Business Publications, Inc. GAS is indexed regularly by Engineering Index Inc. The name "GAS" is registered U. S. Patent Office.

BPA NBP

Win $25.. write a Joe Roughneck cartoon line

Joe Roughneck is a sort of composite spirit of the men who drill for and produce vital oil. You probably know dozens of Joe Roughnecks . . . men on rigs in the field and men running progressive companies. Lone Star is dedicated to supplying them with API casing, tubing and line pipe.

Drawing on your own experience and things you've heard . . . send us a Joe Roughneck cartoon line and suggestion for illustration. For every one that we use in our ads, we'll pay $25. Send in your oil field smile lines now. In case the same line is sent in by more than one person, the one with the earliest postmark will collect. All entries become the property of Lone Star Steel. Our employees, our advertising agency and their families may not compete.

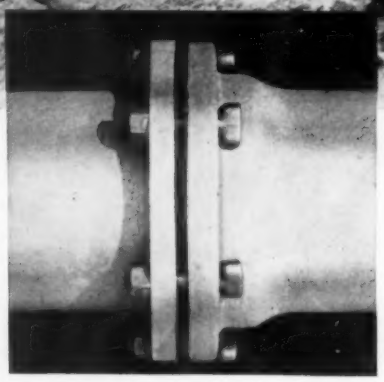
Lone Star STEEL COMPANY

LSS

EXECUTIVE-SALES OFFICES
W. Mockingbird Lane at Roper • P. O. Box 12226 • Dallas, Texas

DISTRICT SALES OFFICES
Houston, Texas | Midland, Texas | San Antonio, Texas
Tulsa, Oklahoma | Wichita Falls, Texas | Shreveport, La.

RETIRE AFTER 65?



Richmond, Va.—Installing 12" Mechanical Joint cast iron pipe for intermediate pressure natural gas main (25 psi).

CAST IRON®

Cast Iron Pipe Research Association, Thos. F. Wolfe, Managing Director, Suite 3440, Prudential Plaza, Chicago 1, Ill.

MECHANICAL JOINT **cast iron**

NOT THIS PIPE

Cast Iron Pipe Serves for Centuries!

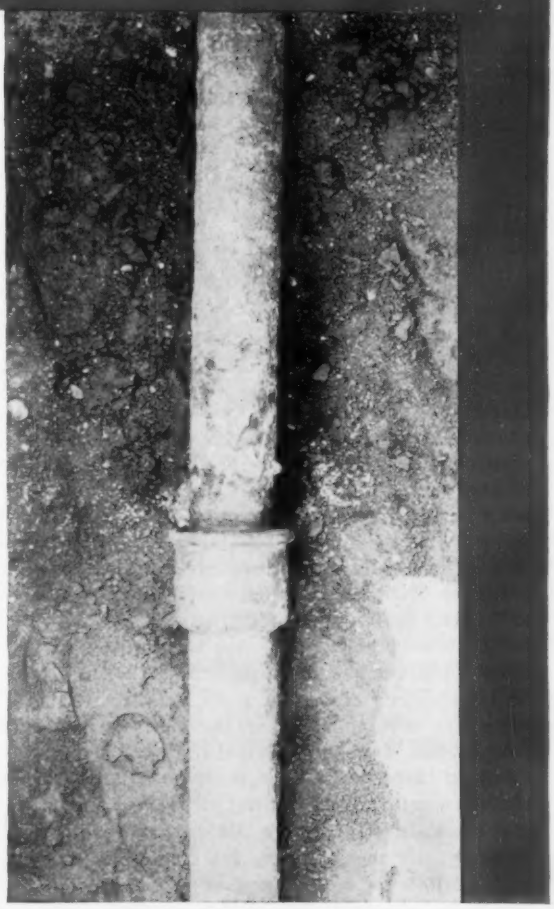
At the century mark, cast iron pipe is still going strong. The records of 40 American gas companies prove it. A hundred years and more ago, these companies installed cast iron gas mains. Those mains are still serving. Literally hundreds of others have passed the fifty year mark in service.

Today, *modernized* cast iron pipe, centrifugally cast, is even tougher and stronger. Its standardized mechanical joints are bottle-tight under all gas distribution pressures . . . and for all types of gas. Wall thicknesses are uniform. Joint design allows deflection during and after installation. Convenient lengths and full range of standard fittings to meet all conditions.

Cast iron pipe is easy to install . . . no special equipment needed.

And cast iron pipe is immediately available. No periodic shortages.

Specify cast iron pipe and centuries of proof back your judgment.



Over 111 years old this 4" cast iron gas main is still in service at Painesville, Ohio.

Nothing unusual about a record like this. Cast iron pipe is built to last. And today's *modernized* cast iron pipe is even stronger, more durable.

A FEW OF THE 40 GAS UTILITIES WITH CENTURY-OLD CAST IRON MAINS IN SERVICE

Peoples Gas Light and Coke Co., Chicago—Consolidated Gas Electric Light and Coke Co., Baltimore—Philadelphia Gas Works—Richmond Gas Works, Richmond, Va.—Hartford Gas Company, Hartford, Conn.

pipe FOR MODERN GAS DISTRIBUTION

GAS Thermally Thinking

You can't ignore service

THE performance of gas appliances is second to none. Performance, however, depends directly on installation technique and calibration of controls. Customer service supervisors in many parts of the nation tell us that the frequency of faulty gas appliance installations is increasing.

It is odd that there should be such a trend during a period when gas company training efforts extended to agencies selling and installing gas-fired appliances are at new highs. But the increase in poor installation practice means that training programs must be stepped up in *intensity* and *quality*. Regardless of where an appliance was purchased and who put it in, if it operates below its designed capabilities it is a reflection on gas the fuel and gas service.

Most poor installations of gas-burning appliances originate from installers hired by department store appliance departments, the appliance "centers," cut-price dealers, and the like. They have their side of the story. Men to deliver and install appliances do not qualify for high pay. As a result, turn-over is terrific. A man learns how to make proper gas appliance installations and then he changes jobs. They have a training problem.

Some dealers, appliance houses, etc., concentrate on the "sell." Their good offices and charming manners do not extend into the installation phase. Such operators do our industry no little harm.

Setting aside the "whys" of the problem, the distribution utilities have to do what they can to combat it. Many companies have gone a long way toward its solution. Others are floundering.

Cooperative training schools seem one of the best approaches. But a gas company has to concentrate on getting installers and servicemen from the indifferent appliance dealers to "matriculate." Many companies tend to help the cooperative dealers extensively and practically ignore those dealers who show little inclination to work with the gas utility.

In the majority of the cases, the installers from the indifferent dealers are making most of the substandard installations of gas appliances. It seems logical that a company should concentrate on getting these people to participate in appliance and controls installation and service training programs.

But the main point is to invite appliance dealers—of all forms —to send their men to these training programs. If they don't accept, go to work on them in earnest.

Appliance and control manufacturers can—and some do—aid in this field. They can provide technical representatives—not salesmen—to some of the meetings to give first-hand instruction. They can furnish modern displays and training mock-ups or other aids. They can put more emphasis on getting new developments into the hands of the installers and servicemen.

Dealer, manufacturer, and gas utility can and must work together to eliminate poor gas appliance installation. The goal is common to the group. Leadership can be best supplied by the gas utility.

J. Fred Ebdon

EDITOR

A CHILTON PUBLICATION
198 S. Alvarado St., Los Angeles 57
Tel. DUnkirk 7-4337

Frank Chapman, Publisher

J. Fred Ebdon, Editor

Don Wright, Managing Editor
Guy Corfield, Technical Editor
Barbara Hall, Assistant Editor

Gilbert Bowman, Promotion Manager
Mary Lou Hanson, Production Manager
M. A. Kesterson, Circulation Manager
Raymond A. Grote, Art Director

ADVERTISING OFFICES

New York (17)
Joseph R. Geryk
100 E. 42nd St.
OXford 7-3400

Cleveland (15)
Frank J. Enright
930 B. F. Keith Bldg.
1621 Euclid Ave.
SUperior 1-2860

Chicago (1)
Richard L. DeMuesy
360 N. Michigan Ave., Suite 418
RAndolph 6-2166

Tulsa
John Sangston
621 Petroleum Bldg.
Office: LUther 4-1769

San Francisco
Frank McKenzie
Merchandise Mart
1355 Market St.
UNderhill 1-9737

Los Angeles (57)
Jack Kay
198 S. Alvarado Street
DUnkirk 7-4337

JOS. C. HILDRETH, Board Chairman
G. C. BUZBY, President

Vice Presidents: P. M. Fahrendorf, Harry V. Duffy. Treasurer, William H. Vallar; Secretary, John Blair Moffett; Directors: George T. Hook, Maurice E. Cox, Frank P. Tighe, Leonard V. Rowlands, Robert E. McKenna, Irving E. Hand, Everit B. Terhune, Jr., Russell W. Case Jr., John C. Hildreth, Jr.

Where else can you buy so much machine... for so little money?

YOU PAY
just $5,580

FOB Factory,
plus taxes, where applicable.
(Price subject to change.)

YOU GET

- **A heavy-duty industrial tractor** with 148 cu. in. gasoline engine . . . industrial bumper and radiator guard . . . recessed headlights . . . husky one-piece forged steel front axle . . . heavy-duty front wheel bearings, extra-heavy subframe assembly and 13 x 24 6-ply rear tires.
- **Heavy-duty backhoe** with big-capacity pump, telescoping tubular steel stabilizers and hydraulic foot-controlled 180° swing.
- **½-yd. front-end loader** with power-leveling and 60° grading angle.
- **Effortless power-steering** — PLUS famous Case shuttle transmission, which lets you go forward or back-up instantly, at 27% *faster speed in reverse* — WITHOUT SHIFTING GEARS!

CASE

Famous for quality for over 100 years

If you're looking for an *inexpensive multi-purpose rig*, to cut your costs on trenching, loading and clean-up jobs, you'll find that no other machine on the market can match the quality, performance and low price of the new Case 320 *industrial* backhoe-loader. This is because the complete unit — tractor, backhoe, loader, even the engine — is engineered, built and factory-mounted by Case, with only ONE manufacturing profit. No "hidden extras" . . . *no messy split-responsibility on warranty or service.* Best of all, your nearby Case Industrial Dealer will give you "the best deal in town", with *easy monthly payments* that let you pay as you earn. Call him today for the complete story, or mail coupon below for free descriptive literature.

Case also builds a full line of TerraTrac crawlers — from the low-priced 42 HP angle-dozer pictured here — to big 100 HP models, with 2-cu. yd. shovel-buckets. Check coupon for more facts.

Clip . . . mail today

J. I. CASE CO., Dept. E1397, Racine, Wis., U.S.A.

Send free literature on: ☐ Case 320 Backhoe-Loader
☐ 42 HP TerraTrac Dozer ☐ 2-cu. yd. TerraTrac loader

Name..... Position.....

Company .....

Address .....

City..... State.....

C-BL-31

industrial wheel and crawler tractors • loaders • dozers • backhoes • fork lifts

GAS highlights

MAY 1957

SPOT NEWS, TRENDS, COMMENT ON GAS INDUSTRY AFFAIRS

President Eisenhower has voiced his support of the "principles" of the new Harris natural gas bill.

He does not, he said, necessarily approve of "every word of it."

With the President's backing on the record, the next big question mark for supporters of the bill is the budget bureau's word-by-word views on the measure. This would set the Administration's specific position on the legislation.

The president's support brightened prospects for eventual Congressional passage of the controversial measure.

Speaker of the House Sam Rayburn (D.-Texas) says the President's endorsement improves the bill's chances to be "considered" this year, but he indicated the President will have to keep plugging for it and "round up some votes for it" personally if it is to succeed.

Rayburn makes it clear the Democrats are still miffed over what they consider the President's betrayal last year when he vetoed a somewhat similar bill. Rayburn said the bill wouldn't be called to the House floor unless "We can get some votes we didn't get" in 1956. These are the ones the President must round up, he indicated.

Meanwhile, objective analysis of the Congressional temper raises serious doubts that the bill can get to a final Senate vote this year. It takes an average of at least four weeks for a Congressional committee to hold hearings and report out a bill, plus another week or two before it usually comes up for a final floor vote. Thus, it would take in the neighborhood of 15 weeks or more to get it through both the House and Senate, and the Congress usually adjourns in mid-July.

Talk is that supporters of the bill will concentrate on getting House approval this year, where the bill faces the closest vote, and let it "sail through the Senate" next year.

Full text of the President's statement on April 17: "I have heard about the bill and its general terms. I have not seen it, but I was told that a number of my assistants and associates have seen it.

"It . . . from what I can understand, it agrees in general with the criteria that I announced was necessary in a bill I would approve when I vetoed the one a year or so ago.

"I repeat that what we have to do here is look at the consumers' problems, both from the standpoint of a fair price immediately, and continuing supplies, so there is stability in the organization. The . . . I mean stabilization in the whole activity.

"Incidentally, I am a user of natural gas myself, and when I pay $3.31 a thousand, and am notified it is going up 50 cents next month, why I am very interested in the whole business.

"But I do believe we do have to have a natural gas bill to bring about a fair, equitable arrangement in this whole field. And from what I understand about this bill, I believe its principles are those which I approve. And that doesn't mean, of course, that I have seen it and approve of every word of it." (Reported by Neil Regeimbal, GAS' Washington bureau.)

Rocky mountain and central states that were snowed-in during the recent fierce blizzards report that on the whole gas service stayed normal while electric power and other utility services suffered interruptions. Another case where efficient gas service proved its excellent dependability.

Over 800 distribution men attended the AGA Distribution Conference of the Operating Section at Houston in early April. Most of the hotel lobby talk was concerning chances for passage of the new bill to amend the Natural Gas Act. Most distribution delegates felt the bill was an improvement over the Harris bill of last year, but reasoned chances for passage were not too good. We would classify the attitude of the distribution segment as being quietly cooperative on the newest bill to "free" independent natural gas producers from federal control. This is a distinct change from their opposition to the idea last year.

Meetings at the AGA Distribution Conference that held the center of interest were those associated with more automatic operations in distribution systems. Such subjects as telemetering and supervisory control, audio tone control, electronic engine (automatic) analyzers, and computers and analyzers drew largest audiences. Interest was also high in plastic meters, use of epoxy resins for sealing cast iron pipe joints and for internal coatings, and paints and the preparation of surfaces to be painted.

Although weather was colder in spots during the 1956-1957 heating season, many distribution men were disappointed. Predictions and early indications had pointed to a return to the good old-fashioned winters. In many parts of the country the predictions held true. And, in other parts of the nation late blizzards were taxing the capacity of distribution and pipeline companies. On the whole, the heating season was better than last, but not up to optimistic forecasts.

FISHER® TYPE 66

AVAILABLE IN 2" SCREWED AND 3" AND 4" FLANGED CONNECTIONS,

THE "66" IS A NUMBER TO REMEMBER

FOR LOW PRESSURE–HIGH VOLUME–PRECISION REQUIREMENTS

• *With same essential construction the Type 66R Zero Governor is also available.*

QUALITY
PRECISION
SIMPLICITY

• These Keynote Features of the Type 66 make it the ideal gas regulator where inlet pressures are under 5 PSI and where large volumes of gas precisely controlled at inches of water column are required for:

INDUSTRIAL FURNACES
LARGE APPLIANCES
GAS ENGINES
COMMERCIAL APPLICATIONS

Write for Bulletin P-66

FISHER GOVERNOR COMPANY
MARSHALLTOWN, IOWA • WOODSTOCK, ONTARIO

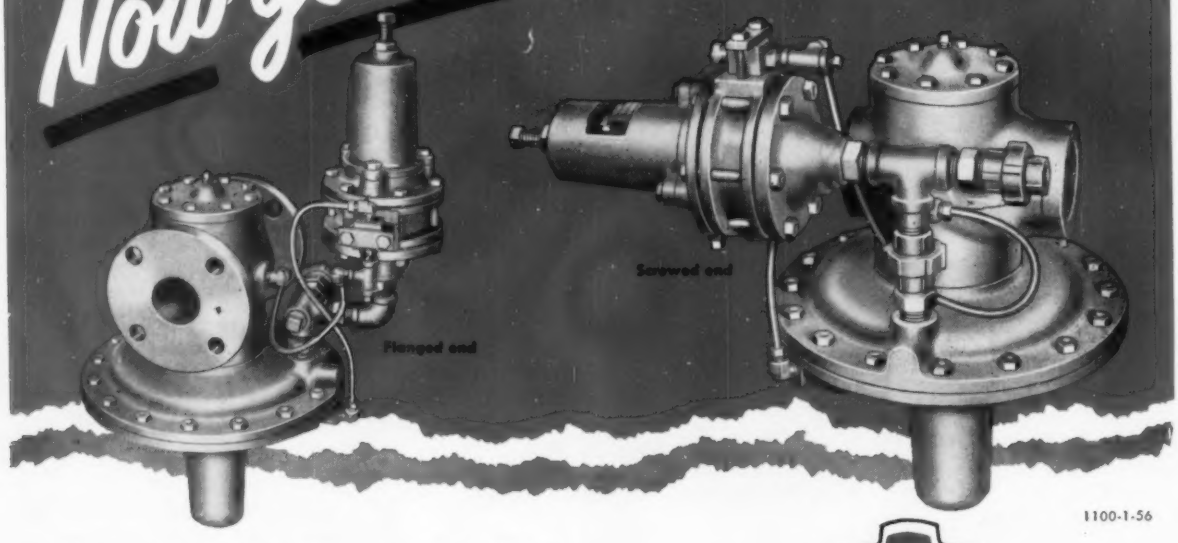
LINE PRESSURE GOING UP!

MEMO
FROM THE OFFICE OF THE PRESIDENT

Geo:—
Considering raising line pressure
Better check this—
Now good up to 400 psi
Rell.

Chaplin-Fulton '1100' REGULATOR

Now good up to 400 psi



1100-1-56

Now, more versatile than ever—good up to 400 psi. Your choice of three body assemblies—

2" flanged 250 lb.	rated for 400 psi
2" screwed end	rated for 400 psi
2" flanged 125 lb.	rated for 175 psi

All suitable for outlet pressure range from ounces to 150 psi with no change required in regulator or pilot—just change the pilot spring. It's accurate—versatile—compact! A good buy!

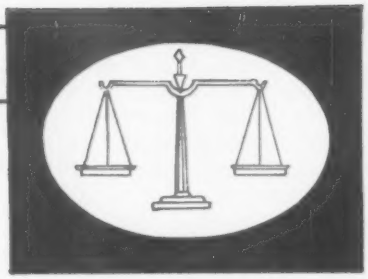
Why stock two, when Model '1100' will do?

And, if 400 psi is too low, why not try the all-steel Model '1200', good up to 1200 psi inlet and 600 psi outlet?

Full information on request.

ACCURATE CP MFG. CO. DEPENDABLE

Chaplin-Fulton
MANUFACTURING COMPANY
Pittsburgh 25, Pennsylvania



Gas and a gasping Congress

CONGRESS is gasping for breath from the injection of numerous recommendations for gas legislation.

A significant development is the recent recommendation of the Federal Power Commission which abandons the former position to exempt independent natural gas producers from Federal regulation. The FPC has asked Congress to make its regulatory job easier while retaining some control. The magnitude of the FPC job is indicated by the 884 rate changes filed by independent producers during February alone. In addition, there are 386 independent producers' rate cases pending.

Since the 1954 Supreme Court decision in the Phillips case requiring FPC regulation of producers there has been a great volume of certificate cases. During that period of time more than 8000 applications for certificates of public convenience and necessity to sell gas that enters interstate commerce were filed by independent producers. More than 2000 certificate applications were awaiting decision by FPC in March of this year.

The current attitude of FPC must reflect President Eisenhower's firm endorsement of legislation to relax regulation of independent natural gas producers while protecting consumers.

The President's recommendation

The President in his budget message to Congress renewed his endorsement of legislation conforming to the objectives of the Harris Bill. Then he added:

"It is essential that consumers of natural gas be protected. We must endeavor to make sure that there will be continued exploration and development of adequate field supplies of gas, and that producers' sales prices are arrived at fairly and competitively.

"In this way, and with authority vested in the Federal Power Commission to regulate interstate pipelines as to the price at which gas may be charged as an item of cost in fixing their rates, the price to the public will be fair.

"Legislation freeing gas producers from public utility-type regulation is essential if the incentives to find and develop new supplies of gas are to be preserved and sales of gas to interstate markets are not to be discouraged to the detriment of both consumers and producers, as well as the national interest."

FPC and the producers

The main point in the FPC's new proposals would give independent natural gas producers the benefit of a fair field price or commodity value of their gas. Generally the fair field price is higher than the utility type of price fixing known as the depreciated original cost base. Everybody knows that you obtain delirious results from the utility rate base method of fixing gas producers' prices. The cost of producing gas differs with the economic cycles and the time when wells were drilled.

FPC made four additional recommendations concerning legislation affecting independent gas producers. FPC asked Congress to amend the Natural Gas Act to provide for:

(1) elimination of any requirement for certificates for producers of natural gas;

(2) elimination of any mandatory requirement for considering costs or revenues associated with by-products from the production of natural gas;

(3) the same pricing treatment of independent producers and interstate pipeline companies that produce their own gas; and,

(4) elimination of provisions in independent producers' contracts to sell gas to interstate pipeline companies which require a change of price paid by the pipeline when the resale price is increased, or when any pipeline pays higher prices to producers in that region.

There is a compromise gas proposal embodying ideas by producers, pipelines, and distribution companies. Some backers of this legislation consider it to be the wrong time to seek action, because there is a current storm of protest over crude oil price increases. The gas and oil industries are considered as one industry in the public mind.

The legislation which appears to have the backing of the three segments of the natural gas industry would relieve the producers from Federal regulation, but provides for FPC review of the contracts under which the gas is sold to interstate pipeline companies.

From a customer standpoint, those favoring this amendment think that this legislation will assure adequate continuing supplies of natural gas at reasonable prices.

From a producer's viewpoint, it is thought that the amendment will permit him to sell gas at a definite negotiated price with the pipeline company. This price must meet the test of the "reasonable market price" standard to be relieved from burdensome regulation. The proposal is expected to

A monthly commentary on national and state developments by an expert in the field of utility law.

contain adequate incentives to explore for new gas reserves.

The proposal also outlaws indefinite pricing provisions of contracts called "favored nations," "price redetermination," and "spiral escalation" types in all future contracts.

It is reported that the next move on the natural gas legislation is up to the White House. Even though major producers and distributors have agreed on compromise legislation, the Congressional leaders want the President to assume responsibility before placing the legislative machinery into high gear.

In addition to the highly publicized legislative proposals concerning independent natural gas producers, FPC has asked for numerous amendments. The commission has recommended that the Natural Gas Act be amended as follows:

1. To give the commission control over the issuance of securities of natural gas companies.

2. To give the commission authority to compel the interconnection of gas facilities.

3. To permit the voluntary interconnection of natural gas facilities on a permanent basis for emergency use, conferring a jurisdictional exemption.

4. To give the commission broad investigatory powers with respect to the natural gas industry similar to those it now has with respect to the electric industry.

5. Persons importing or exporting natural gas from or into a state adjacent to the foreign country should be defined as "natural gas companies" and subjected to all the requirements of the Natural Gas Act.

6. The commission should be authorized to suspend rate schedules covering sales of natural gas for resale for industrial use only and to increase rates where necessary to prevent discrimination.

7. Mandatory hearings are now required in connection with the issuance of certificates or abandonment of service or facilities. An opportunity for hearing would appear to be sufficient.

8. Commission should have authority to control the allocation of natural gas where required for the natural defense or to safeguard the available supply.

9. The commission's authority to grant temporary certificates should be enlarged to include any emergency situation.

10. A certificate should be required for the construction of natural gas facilities by a person who will not become "a natural gas company."

11. The abandonment section of the Natural Gas Act should be made clear that it applies to service and to curtailment as well as abandonment of service. The section should also require commission approval of the alienation by a natural gas company of reserves which have constituted part of the bases for a certificate.

12. The "service area" provision of the Natural Gas Act should be eliminated and the commission authorized to provide rules permitting the enlargement of existing facilities without further certificate authority.

13. The commission should be authorized to prescribe safety regulations with respect to interstate gas facilities.

14. The rate-changing procedures of the Gas Act should be made available to companies seeking to make unilateral changes in filed contracts.

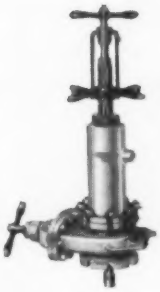
15. The commissioners should "hold over" at expiration of their terms until their successors have qualified. ■

Gas lamp returning as decorative feature for modern dwellings

THE soft glow of gas lights is being relit as decorative feature of modern private dwellings and on driveways throughout the country.

The picturesque beauty of the gas lamp seems to afford a soothing touch to the harried modern existence and it is rapidly becoming one of the symbols of present-day gracious living in many areas. One such place is Woodland road, a private driveway in the Shadyside section of Pittsburgh, served by Equitable Gas Co.

Here, every night, two private patrolmen of the road light the beacons. The 13 gas street lamps represent for the residents, who have formed an association to maintain them, a link with a bygone era of pleasant living.



Unit No. 2...For stopping-off 3" and 4" Line Stopper Fittings. 100 p.s.i. maximum working pressure at 250°F.

NO-BLO®

MUELLER®

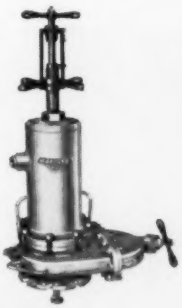
Unit No. 4SW
Stops-off 10" and 12" Line Stopper Fittings. Maximum working pressure 500 p.s.i. at 100°F. Maximum temperature rating 250°F at 375 p.s.i.

LINE STOPPERS

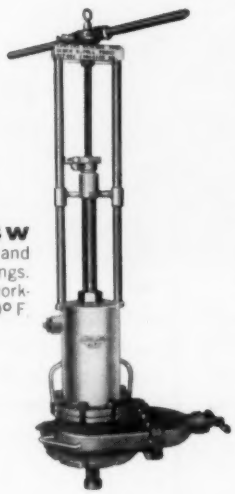
for repair, relocation or tie-in without service interruption.

Unit No. 1...Used with 1½" and 2" Line Stopper Fittings. 125 p.s.i. maximum working pressure at 250°F.

The Mueller line of stopping equipment provides safe stop-offs for lines from ¾" through 12" which are made with the line under pressure, without escape of gas. Two line stoppers and an independent by-pass line may be used to completely isolate a section of pipe without interrupting service. Service fittings from ¾" to 1¼" are stopped off with "E-4" or "T" Drilling Machines.



Unit No. 3...For stopping-off 6" and 8" Line Stopper Fittings. 60 p.s.i. maximum working pressure at 250°F.



Unit No. 3SW
For stopping-off 6" and 8" Line Stopper Fittings. 230 p.s.i. maximum working pressure at 250°F.

Your Mueller Representative has all the facts on Mueller Line Stopper Equipment. Call on him or write direct.

MUELLER CO. 100th YEAR SERVING the Water and Gas Industries QUALITY

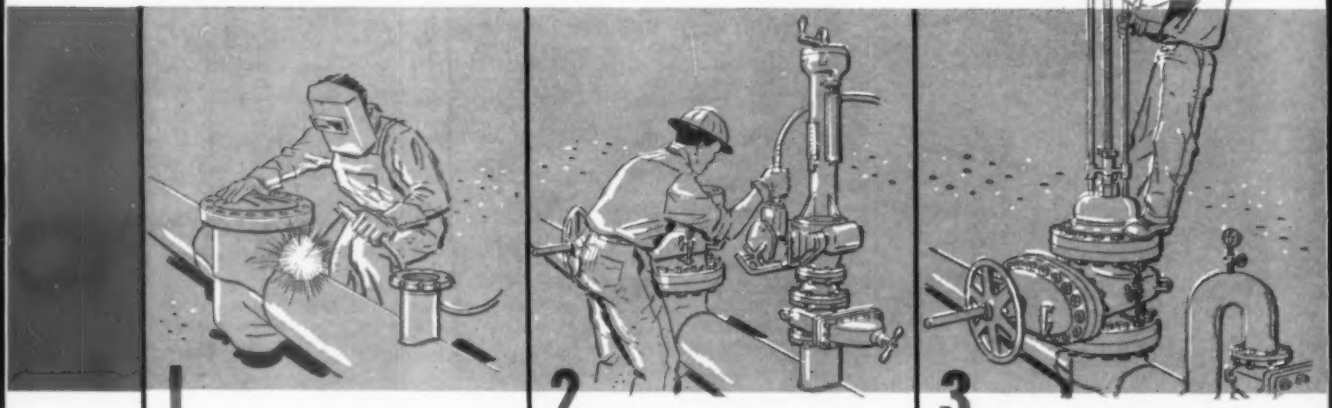
MUELLER CO.
DECATUR, ILL.

Factories at: Decatur, Chattanooga, Los Angeles; In Canada, Mueller, Limited, Sarnia, Ontario

Since 1857

Stop-off 10" or 12" lines...

with a No. 4 SW Line Stopper Unit...



1

WELD! Install two Line Stopper Fittings at the ends of section to which work will be done. Install two Save-A-Valve Drilling Nipples on pipe above and below stopper fittings for by-pass line. Test and attach gate valves.

2

COMPLETE BY-PASS! Drill through nipples with Mueller C1-36 or CC-36 Drilling Machine. Close gate valves, install by-pass line and place in service by opening Drilling Nipple gate valves.

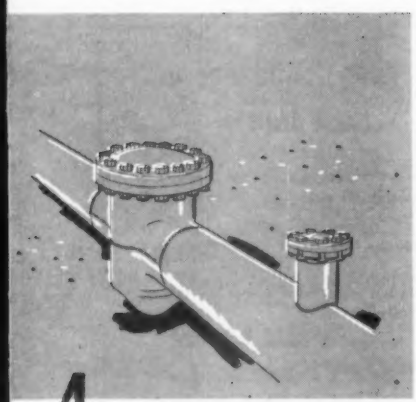
3

STOP-OFF! Cut through Stopper Fittings with drilling machine. Remove drilling machine and attach No. 4 SW Stopping Machine with steel wedge stopper. Expand stoppers.

Keep it Flowing

with Mueller® Line Stopper Units!

- You can provide interruption-free service to customers and *still* make necessary tie-ins, line relocations or pipe line repairs – with Mueller Line Stopper Units. All work is safely completed with the line under pressure and without blowing of gas.
- Flow is maintained with a by-pass line around the section of line being worked on.
- Mueller Line Stopper Units are available for 1½" through 12" lines. Get complete details today!



4

COMPLETE LINE WORK! Make necessary repairs, tie-ins or relocations. Relax stoppers and remove stopping machines. Remove by-pass, insert completion plugs and caps on nipples. Install completion plugs and caps on fittings.

MUELLER NO-BLO® Method

The Mueller NO-BLO® Method and equipment permit the installation of No-Blo fittings into a system under pressure, without escape of gas. Safety is assured and service is *not* interrupted. Call your Mueller Representative or write direct for information.

MUELLER CO. 100th YEAR SERVING the Water and Gas Industries QUALITY

Since 1857

MUELLER CO.

DECATUR, ILL.

Factories at: Decatur, Chattanooga, Los Angeles;
In Canada: Mueller, Limited, Sarnia, Ontario

Installing 6" Mechanical Joint Cast Iron Pipe for gas distribution main in Rhode Island.

old story . . . ever new

The dependability and long life of cast iron gas mains...

Consider: The cast iron mains laid by 40 American gas utilities a century and more ago are still serving. Hundreds more are veterans with 50 years and more of service!

What other pipe can approach, much less match, this enviable record of long term economy and performance?

Remember, too, the modernized cast iron pipe, centrifugally cast today, is even tougher, stronger and ready for prompt shipment.

That's a prospect of still longer life and reliability.

Put Your Confidence in Cast Iron

- Standardized mechanical joints are bottle-tight for usual gas pressures . . . and for all types of gas.
- Centrifugally cast pipe is tough, strong and uniform.
- Joint design allows for deflection during and after installation.
- Service connections are easily made.
- Long life a matter of record.
- No shortage. Cast Iron Pipe is immediately available.

U.S. cast iron PIPE

CAST IRON

U. S. PIPE AND FOUNDRY COMPANY
General Office: Birmingham 2, Alabama

A WHOLLY INTEGRATED PRODUCER
FROM MINES AND BLAST FURNACES TO FINISHED PIPE.

WASHINGTON

New Harris gas bill faces rough road in Congress

By NEIL REGEIMBAL
GAS Washington Bureau

THE new Harris gas bill faces tough sledding in Congress, even though it is a bill to limit but not remove Federal controls over independent gas producers.

Representative Harris, Democratic chairman of the House Interstate and Foreign Commerce Committee, admits his bill (H.R. 6790) will not even be supported by all independent gas producers. He was not ready when he introduced the bill to forecast assured passage by the House, although it has the support of Sam Rayburn (D.-Texas), powerful speaker of the House.

Division on the bill shapes up this way: most, but not all, independent gas producers will support it; pipeline companies, with the possible exception of one, will support it; gas distributors will split about evenly on it; the so-called consumers' committees, the committee of mayors, and union groups will fight it bitterly.

The new bill is not the same measure that has been under study by the Justice department and the White House, but Representative Harris says he is certain that the administration, and the president, "are in accord with what has been proposed."

That the bill does not yet bear the full stamp of approval of the White House, however, is clear from the Republican sponsor of the bill, Rep. Joseph P. O'Hara of Minnesota, the third-ranking Republican on the committee. He says that he has been authorized to say only that the White House "will support the principles in this bill."

The bill, which follows "policy" agreements reached between the Federal Power Commission and Representative Harris last fall, would set FPC control over gas prices on a commodity basis, and actually prohibit utility-type cost base regulations. It would set control of prices at the field, rather than at the mouth of the pipeline, and cover both new and existing contracts. "Objectionable" types of escalation clauses, such as second and third party favored nations, market price, and price index clauses, would be outlawed.

The bill would provide that all new producer - pipeline contracts would have to be filed within 30 days, and the FPC would be empowered to avoid any provision for specific prices that was found to be higher than the reasonable market price. Interested parties in a new contract would have to be notified and they could demand and secure a hearing.

Test of the bill's fate was expected to come "very shortly" after it was introduced on April 10. Representative Harris said he would give the bill to the FPC, the budget bureau (which gives official White House position on legislation), the attorney general, and others for their legislative position.

After these reports are received, the Arkansas legislator said he would set up a schedule of hearings.

As the bill was introduced in the House, there was no immediate indication of a sponsor in the Senate. Sen. William Fulbright (D.-Ark.), a co-sponsor of last year's bill, said he had no plans this year to introduce legislation. Senator Fulbright maintained that the White House should take the initiative.

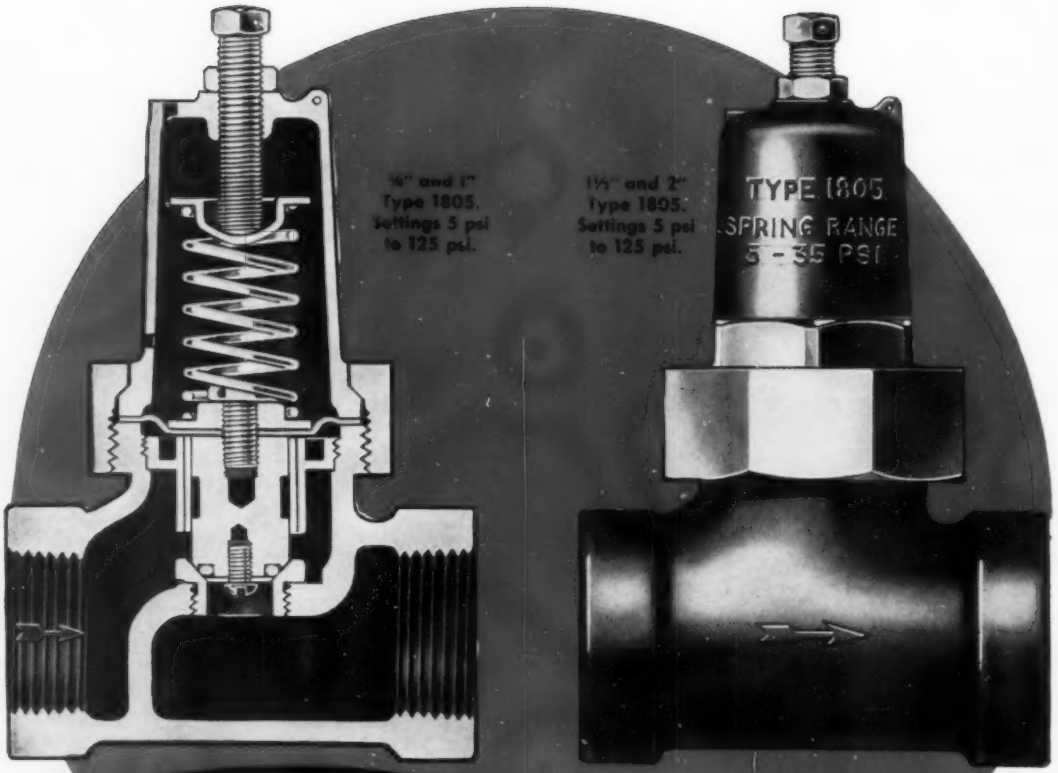
Representative Harris says he believes there is time to get the bill through this year, and that sufficient support will develop when borderline lawmakers realize the bill "will mean lower prices to consumers by stimulating new supplies of natural gas."

Representative Harris says he will not push for passage of the bill unless the president gets firmly behind it. There was some question whether the president would support the specific language in the new Harris bill, or simply the "principle" of gas legislation, as he has done in the past.

Cloakroom talk around the Capitol following introduction of the new Harris bill was that pressure from the "home folks" for another gas bill was too strong, despite the political desire of Representatives Harris and Rayburn to put the president on a spot by refusing to consider gas legislation without a direct request.

The bill would extend FPC jurisdiction to all price increases which occur in the future as the result of "indefinite pricing clauses" in producer contracts, both new and existing. It would give FPC no jurisdiction over the prices set by "definite pricing clauses" in existing producer contracts. But a future amendment to an existing contract is a "new contract" under the bill.

The new Harris bill also sets forth, in some detail, the principles which are to control FPC in arriving at "reasonable market price," making it clear that the public utility rate base cost-of-service concept in not to be used. ■



FISHER®

TYPE 1805 LARGE CAPACITY RELIEF VALVES

The Fisher Type 1805 is an *economical* small self-contained large capacity relief valve for applications where it is necessary to provide protection from over-pressuring a downstream system.

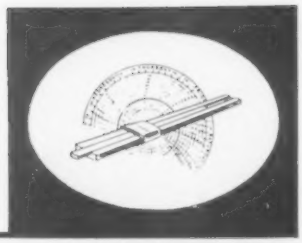
It is suitable for low pressure gas, air, water or vapor lines—and for temperatures not in excess of 150° F. Single seated—soft seat "O" ring construction for tight shut-off.

Sizes: ¾", 1", 1½" and 2".

Relief pressure ranges: 5 psi to 125 psi.

FISHER GOVERNOR COMPANY
MARSHALLTOWN, IOWA • WOODSTOCK, ONTARIO

technical trends



By GUY CORFIELD

"Cue For Survival"

As an aftermath of Operation Cue, the atom bomb test of May 5, 1955 to further the knowledge and experience of the Federal Civil Defense Administration in effects of a nuclear explosion on civilian installations and activities, a 162-page booklet, "Cue for Survival," has been prepared for public information.

It will be recalled that AGA participated in this test by furnishing and installing typical underground and aboveground piping assemblies, regulator and metering equipment, and appliances. A detailed report was written and a summary and conclusions were presented to AGA at the following convention at Los Angeles. (See *GAS*, June 1955, page 53.)

This new booklet covers the entire operation and gives the most important conclusions drawn by the agencies directing the project and the representatives and official observers of the participating organizations. Of specific interest to the gas industry are the reports on: damage to residences and to commercial and industrial structures and their contents; thermal ignition and response of materials; effects on group and family style personnel shelters, electric utilities, communication equipment, LPG installations (made in cooperation with the AGA installations), record storage equipment and contents, trailer coach mobile homes, and emergency automotive vehicles; civil defense safety monitoring techniques; biomedical effects of thermal radiation; and blast effects on structures.

As would be expected, the structures that were most substantially built resisted the blast most effectively; reinforcement, secure fastening of walls to foundations, adequate bracing and nailing, etc., appeared to amply justify their increment of expense. Also as would be expected, thermal ignition and distortion were less for white or light colored materials than for black or dark objects. Rather strangely "the effect of char and scorch was less up to 3500 ft from the ground zero than between 3500 ft and 6500 ft from ground zero; apparently blast wind at close ranges has the effect of terminating the thermal action before it has run its course." Underground shelters were very effective in protecting from radiation, flying debris, and subsequent fallout. Electrical substations and switching yard equipment suffered relatively little damage, but transmission and distribution equipment (aboveground), particularly wood poles, would require repair or replacement. Communications equipment proved to be very shock and heat resistant, as far as the sending and receiving instruments themselves (radio, telephone, TV etc.) were concerned, and was in most cases operable; but aerial antennas and other outside or building-supported structures were blown down or damaged. LPG cylinders of all sizes were surprisingly rugged and in almost all instances, even when blown or rolled considerable distances, resisted puncture and leakage. As reported, underground gas installations remained almost entirely intact, and appliances were damaged beyond usage only in buildings that were virtually demolished. Record storage equipment was rather vulnerable when directly exposed to the blast or with only light structures intervening, but effective when in basements or protected by substantial shielding. Mobile homes, located at fringe areas, survived quite well.

Nuclear power

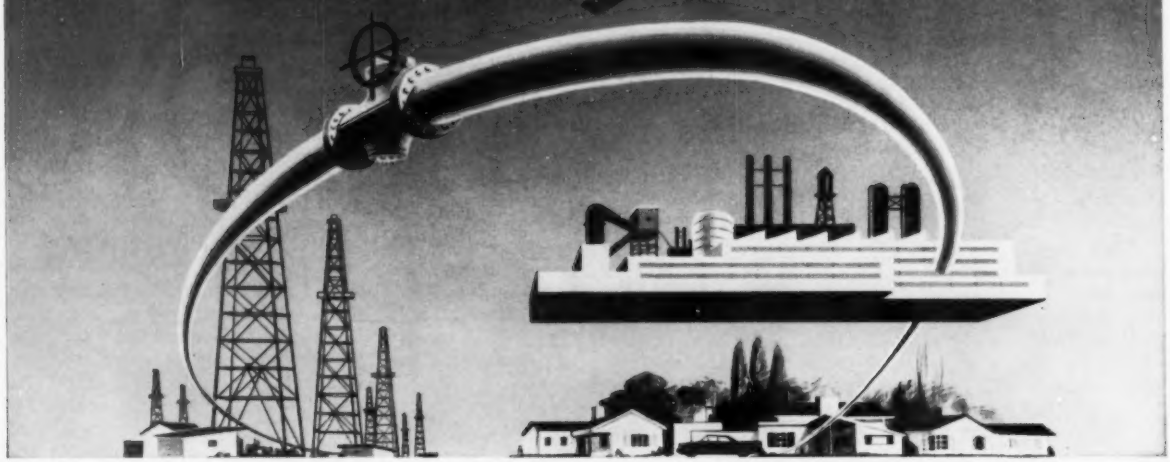
In spite of the personal endorsement by the President of the general "Atoms for Peace" program, and the urgent invitation by the Atomic Energy Commission to private industry to submit plans and proposals leading to power generation with nuclear fuel, very little actual construction of atomic power plants has taken place so far. Quite obviously there is no economic need for such plants in this country at this time, but the amazing rate at which our energy requirements are increasing is thought by many to make it imperative that we develop the know-how as rapidly as possible. There is also the consideration of keeping our position of world leadership in nuclear technology and practical application.

The large amount of space devoted to it in news columns and technical literature, and the apparent prominent place it will take in the deliberations of the new Congress, mark this subject as one of greatest national importance. It also appears that there are some perplexing problems, both to government and to private industry, which can perhaps only be solved or by-passed by greater and more arbitrary government participation and spending than was intended when private industry was asked to participate. The problem of insurance against a plant failure, which could be a local catastrophe, is still unsolved; insurance underwriters do not feel able to give sufficient coverage to satisfy a potential plant operator, and the government has not yet agreed to assist or to assume the liability. There are at least nine different types of nuclear reactors for heat generation, and their relative merits are quite controversial.

If the plants now under construction, or approved for construction by AEC, are completed and placed in operation, the first nuclear power will probably come from a government plant at Shippington, Pa.; it will be operated by Duquesne Light and generate 65,000 Kw. The first industry-owned installation to go in operation may be at Livermore, Calif.; the reactor is being built by General Electric, and Pacific Gas & Electric Co. will use the heat to generate about 5000 Kw.

30 years of progress with the Natural gas industry

ORONITE®



Since the first commercial gas odorant production, Oronite is proud to have become an integral part of the gas industry. Manufacturing and technical facilities have been continuously expanded through the years to fulfill the ever-growing requirements of this dynamic industry. Today, and in the years ahead, you can look to Oronite for the finest odorant products and most complete service.

Oronite's service to customers is unequalled!

Oronite maintains a technical field service staff of trained odorant specialists who work closely with the utility and transmission companies. These men are backed by extensive laboratory facilities to assist in solving individualized customer problems. As a further service, Oronite's unique odorometer offers the simplest way to test odor intensities and determine adequate odorization.

A phone call or letter to any Oronite office will promptly bring an odorant specialist to consult and assist you on gas odorization.

Oronite's complete and versatile line of gas odorants!

Calodorant® C—completely stable cyclic sulfide-type odorant
Calodorant® C Special—blend of Calodorant C and solvent
Calodorant® B-1—a sulfide odorant at a mercaptan price
Alert® 80—best economy-priced, quality mercaptan odorant
Ethyl Mercaptan—a high quality pure mercaptan for LP gas
LPG Odorant—tailor-made from a selected mercaptan cut

ORONITE CHEMICAL COMPANY

EXECUTIVE OFFICES
200 Bush Street, San Francisco 20, California
SALES OFFICES
New York, Wilmington, Chicago, Cincinnati, Dallas, Los Angeles, San Francisco
EUROPEAN OFFICE
36, Avenue William-Favre, Geneva, Switzerland

4209

THE ROCKWELL GAS REPORT

DEVOTED TO THE INTERESTS OF THE GAS INDUSTRY

VOL. 2 MAY 1957 NO. 1

Introducing
The **ROCKWELL-Nordstrom** Valve-Regulator

THE ROCKWELL-NORDSTROM VALVE-REGULATOR

by J. A. Bonner, Engineer,
Central Gas Engineering Dept., Rockwell Manufacturing Co.

Over the past twenty-five years, gas pipeline and distribution operations have grown considerably in terms of loads and capacities. But, like any other rapidly growing business, gas companies have had to keep a constant watch on increased operating costs. The new Rockwell-Nordstrom Valve-Regulator is an example of a product development whose basic need is specifically based on reduction of operating costs and increased efficiency in gas pipeline operations.

Actually, the Rockwell-Nordstrom Valve-Regulator is not strictly a new product development. Over twenty years ago, some gas distribution and transmission companies devised their own pressure regulation systems incorporating a Rockwell-Nordstrom lubricated plug valve "positioned" by a cylinder actuator. The Nordstrom valve was used because it afforded much more precise control than other types of valves. Also, the lubricated plug requires much less torque for movement and assures instant response. Even twenty years ago, of course, the Nordstrom valve was an "old timer" to the gas industry.

In order to keep the cost of transporting gas to a minimum, it is necessary that the pipeline be operated at maximum flow and pressure. This, of course, means that pressure regulating equipment may—at times—be wide open and should offer a minimum of pressure loss. The flow pattern of a Rockwell-Nordstrom valve insures a minimum of pressure loss when in the full open position. And unlike conventional regulators, there is no "*change of direction*" in the flow stream, so the pressure loss is kept to a minimum. For example, the pressure loss on a Venturi Pattern Rockwell-Nordstrom Hypreseal valve can be compared with the overall pressure loss occurring in a Venturi meter.

Another regulating problem of modern times is the reduction of noise. Regulating stations which formerly were located in rural areas are now surrounded by housing developments. When ordinary regulators are installed above ground it is necessary to soundproof the station buildings. This is a costly, complicated procedure. However, when Rockwell-Nordstrom valves are used as part of a regulator device, the valve can be equipped with extensions and the valve body buried in the ground. The earth serves as a natural sound barrier and costs are greatly reduced because the Rockwell-Nordstrom valve does not require expensive boxes or vaults for underground installation.

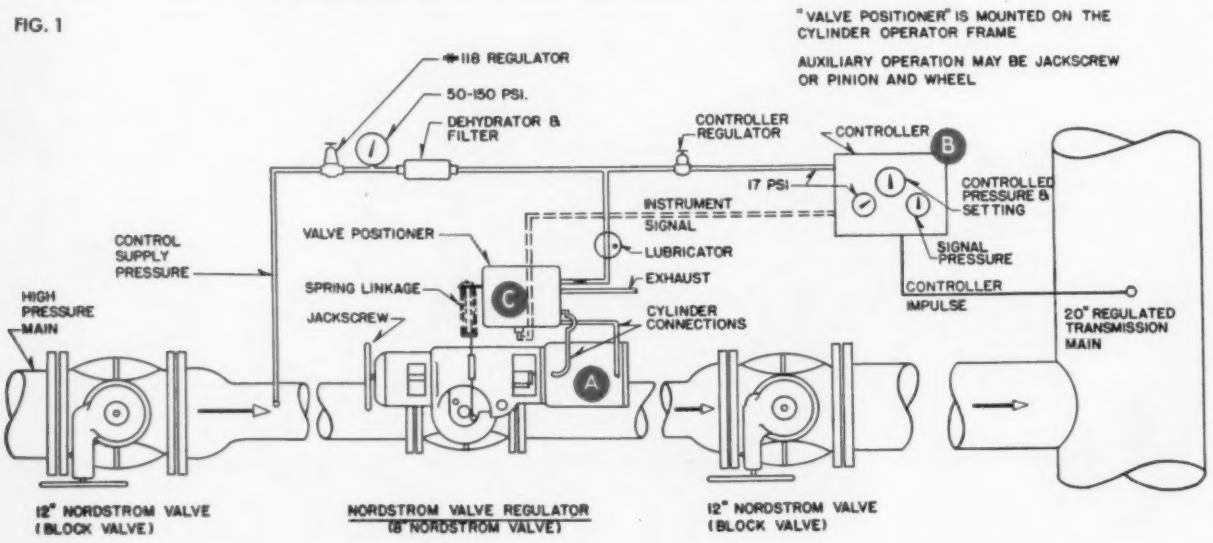
Although the cylinder operated plug valve regulator is effective on services such as low pressure control, back pressure relief, or on widely varying flows, it is at its best on high pressure applications where fairly large volumes are encountered. A typical installation would be a regulator furnishing high pressure gas to a city from a transmission line. Quite often, such stations must also limit the maximum flow and therefore, have pipeline capacitance between this station and the main town border station. Other useful applications include controlling gas coming out of storage and supplying gas to the town border stations.

How It Works

A typical set up of the Rockwell-Nordstrom Valve-Regulator is shown below. Basically, the regulator is a standard Rockwell-Nordstrom valve, the plug of which is automatically positioned by a piston type operator. In many ways, its operation is quite similar to that of a conventional diaphragm or motor head regulator. The difference is that pressure is used to position the valve in *both* directions whereas in the conventional regulator, a spring creates the force for movement of the valves in one direction.

The throttling action of the valve depends on the plug angle. Since the cylinder operator is the unit which supplies the power to turn the plug, the cylinder operator (A) is pressure ac-

FIG. 1



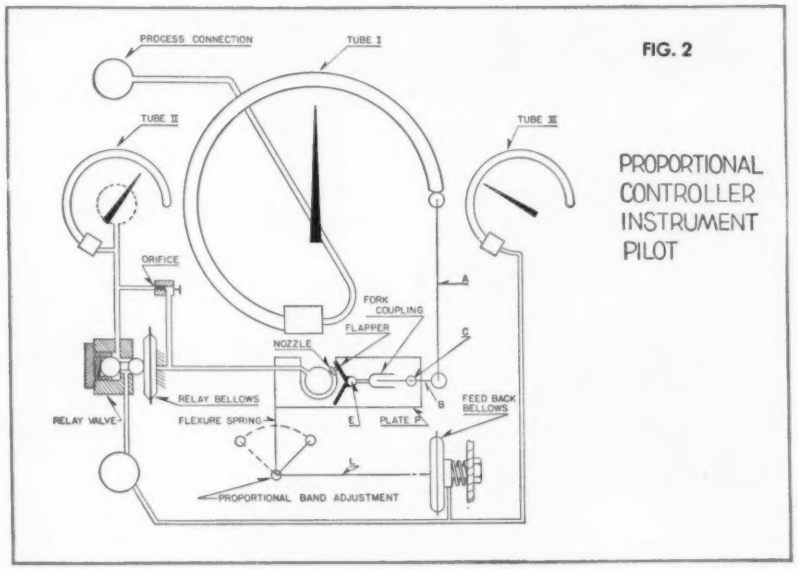


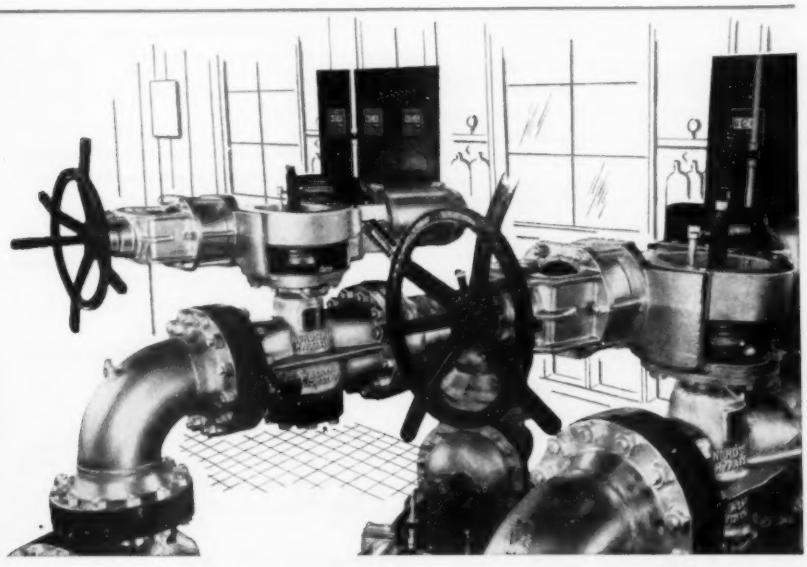
FIG. 2

PROPORTIONAL CONTROLLER INSTRUMENT PILOT

tuated to produce the proper valve position for throttling conditions. Normally, the cylinders used require pressures above 50 psig because lower pressure would require excessively large cylinder operators.

Automatic pressure control requires a pressure measuring device and a device for positioning the cylinder operator to give the proper throttling. The Rockwell Instrument Pilot (B) is the measuring unit and the primary control element of the Rockwell-Nordstrom Valve-Regulator. The Instrument Pilot determines the pressure variations and immediately causes corrective action through its control element. The Instrument Pilot produces a signal pressure of 3 to 15 psig of which each increment of pressure has a relationship to the position of the cylinder piston. However, the piston requires pressures in excess of the instrument output and also requires a pressure system that will act on either side of the piston. Since the Instrument Pilot cannot meet these requirements a pneumatic relay is placed between the primary control element and the cylinder operator.

A valve positioner (C), which is a pneumatic relay, converts the instrument signal pressure into a higher pressure differential across the operator piston. The valve positioner—by its unbalance—opens its relay pilot valves to cause pressure to move the piston in the direction of valve opening, while venting the opposite side of the piston. As the piston moves, the mechanical linkage between the piston and valve positioner causes a return to balance in the valve positioner and closes the relay pilot valves which stop the piston movement causing the regulator valve to remain in its new position.



The Instrument Pilot maintains the same signal pressure as long as the regulator outlet pressure does not change. However, immediately upon a change in outlet pressure, the Instrument changes signal pressure to reposition the regulator valve and reestablishes the outlet pressure setting. The rate at which the piston travels determines the relative stability of the control system and the rate of movement must be determined by considering the response time of the system being fed by this regulator. Piston speed can be easily determined at the time the regulator is put into operation.

The Instrument Pilot

(Fig. 2) consists of a measuring unit and control element producing a signal pressure of 3 to 15 psig. The Instrument requires a 17 psig supply for operation and this supply is normally taken from a No. 118 Rockwell Regulator supplying the control system. Since the instrument supply should be dry and filtered, it is advisable to place a dehydrator in the supply line.

The Instrument Pilot is shown in schematic form in (Fig. 2). The operation of instrument is as follows: The outlet pressure of the Nordstrom Valve Regulator is measured by the pressure measuring unit which positions the flapper valve (A) through link (B) to lever (C) through the fork coupling to the flapper which moves about its central pivot. The supply pressure shown on the supply pressure gauge (E) flows through the orifice restriction to the nozzle and to the relay bellows; also, supply pressure is led to the relay valve block. The relay valve consists of two steel ball valves which are controlled by the relay bellows. The valve stroke at normal capacity is about 0.007", corresponding to a bleed rate of ½ CFM at 9 psig signal pressure and a capacity of 1¼ CFM. Optional values of half or double may be obtained.

If the flapper position is changed in relation to the nozzle, the pressure in the system produces a change of position in the relay bellows. The orifice is about .010" diameter restriction while the nozzle has a .020" diameter opening. If the flapper moves away from the nozzle, a pressure decrease will occur causing the relay bellows to collapse making the relay valve vent port open and the supply port close causing the signal pressure to decrease. This decrease of signal pressure will cause the feedback bellows

(L) to collapse and through link and the proportional band adjustment lever give an upward thrust to the flexure spring. This motion will cause Plate to move clockwise about the pivot of the flapper and to lower lever to cause return movement to the flapper. This action, which counteracts the initial movement, causes the control to reach equilibrium with the change in signal pressure proportional to the change in measurement.

The new signal pressure will cause the regulator to open and bring outlet pressure to normal and the sequence of events will proceed as measurement returns to the set point. The speed of which these events proceed is quick; the signal pressure changes follow the measurement changes in a smooth corrective action.

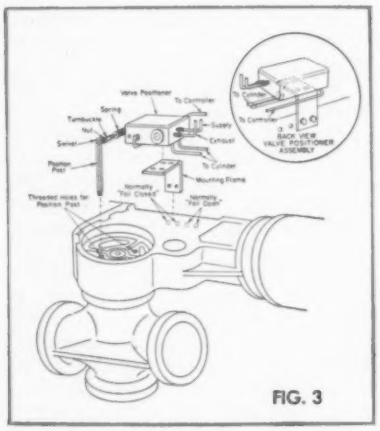


FIG. 3

Operation of the Valve Positioner

The valve positioner (Fig. 3) incorporated in the Nordstrom Valve Regulator serves as a pneumatic relay and a mechanical "feedback" device to prevent over travel and to stabilize the system.

Basically, the valve positioner balances the piston in direct relationship to the signal pressure of the Instrument Pilot.

The signal pressure of the instrument is applied to the valve positioner bellows. This creates an upward force on the lever system causing the valve to move upward, opening the supply to one side of the cylinder and exhausting the other side of the cylinder. Counteracting this force is the external spring which returns the lever system to a balance of forces as the piston moves. This balance of force returns the pilot relay valves to a central position stopping the piston's movement.

The internal spring is used to obtain a zero effect or balance at the initial

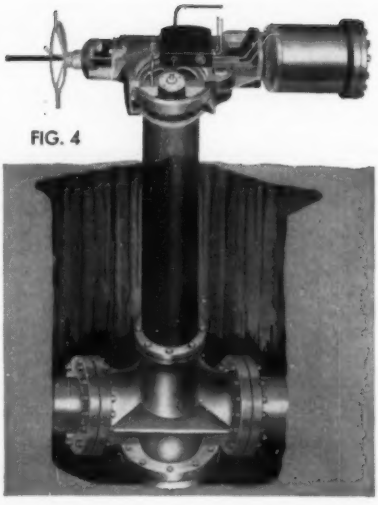


FIG. 4

stroke of the piston. The adjustment of stroke is accomplished by moving a rack and gear fulcrum adjustment between the two levers.

The supply pressure to the valve positioner is set at the required cylinder pressure depending upon the rate of piston movement desired. The cylinder exhaust can be piped to atmosphere. A lubricator is placed in the supply line of the valve positioner to provide lubrication to the piston.

Fail Open—Fail Close

Consistent with good safety practice, the Rockwell-Nordstrom Valve-Regulator can easily be set up for either "Fail Open" and "Fail Closed" operation. This means that if for any one of a number of operating reasons (such as a line break) the signal pressure is lost, the valve will instantly move to a completely open or a fully closed position.

Extensions

Some regulator installations have become objectionable because of the noise caused by the throttling action of the regulator. The Rockwell-Nordstrom Valve-Regulator is quieter than a conventional regulator, but when large capacities are encountered even this noise could be objectionable if the station is in or around housing areas.

Rockwell-Nordstrom Valve-Regulators can be furnished with extensions which permit the Nordstrom valve itself to be buried while the cylinder operator and controls are at ground level. Such installation takes advantage of the insulation to sound that ground offers, without requiring special vaults or bringing the transmission lines to the surface. The Nordstrom valve is a sealed unit and the extension makes the valve operating equipment available for inspection and maintenance.

Questions and Answers

1 Q What is the line size limitation?
A The Rockwell-Nordstrom Valve-Regulator is normally used on lines 6" and larger.

2 Q What are the pressure limitations?
A The regulator is most efficient on pressures over 50 psig inlet.

3 Q Does Rockwell manufacture just the valve or is the entire unit shipped as one piece?
A The complete unit is supplied by Rockwell Manufacturing Company, but is shipped dis-assembled.

4 Q What special technical personnel are necessary to install the Rockwell-Nordstrom Valve-Regulator?
A None.

5 Q Do you have to lubricate the valve?
A Yes. Lubrication insures longer life at lower cost.

6 Q What about wear? The valve seems to move a great deal.
A Lubrication prevents metal-to-metal wear.

7 Q Are block valves necessary?
A Yes. Like any regulator installation, block valves are almost always recommended.

8 Q Are by-pass lines necessary?
A Yes. They are an added safety factor that should be considered for every regulator installation.

9 Q What kind of a vault is used for buried installations?
A Since the Rockwell-Nordstrom valve is a self-contained unit, the addition of valve extension permits burying the valve without a vault and with a minimum of excavation.

10 Q Do I have to fabricate extensions?
A No. Valve extensions are available from Rockwell.

11 Q Can I use the Rockwell-Nordstrom valves in my inventory and order just the other components?
A Yes.

12 Q Can any other type of plug valve be used?
A No.

13 Q How far away may the instrument controller be located from the regulator?
A Distance should not exceed 100 feet.

These Galvomag anodes give us 25% more current than conventional magnesium anodes

Two questions should be asked by anyone who is planning to use galvanic anodes to protect well casings or other underground equipment:

(1) Which anode has the greatest throwing power? Galvomag® magnesium anodes deliver 25% higher current than conventional magnesium anodes—enough punch to assure adequate protection in high-resistivity soils.

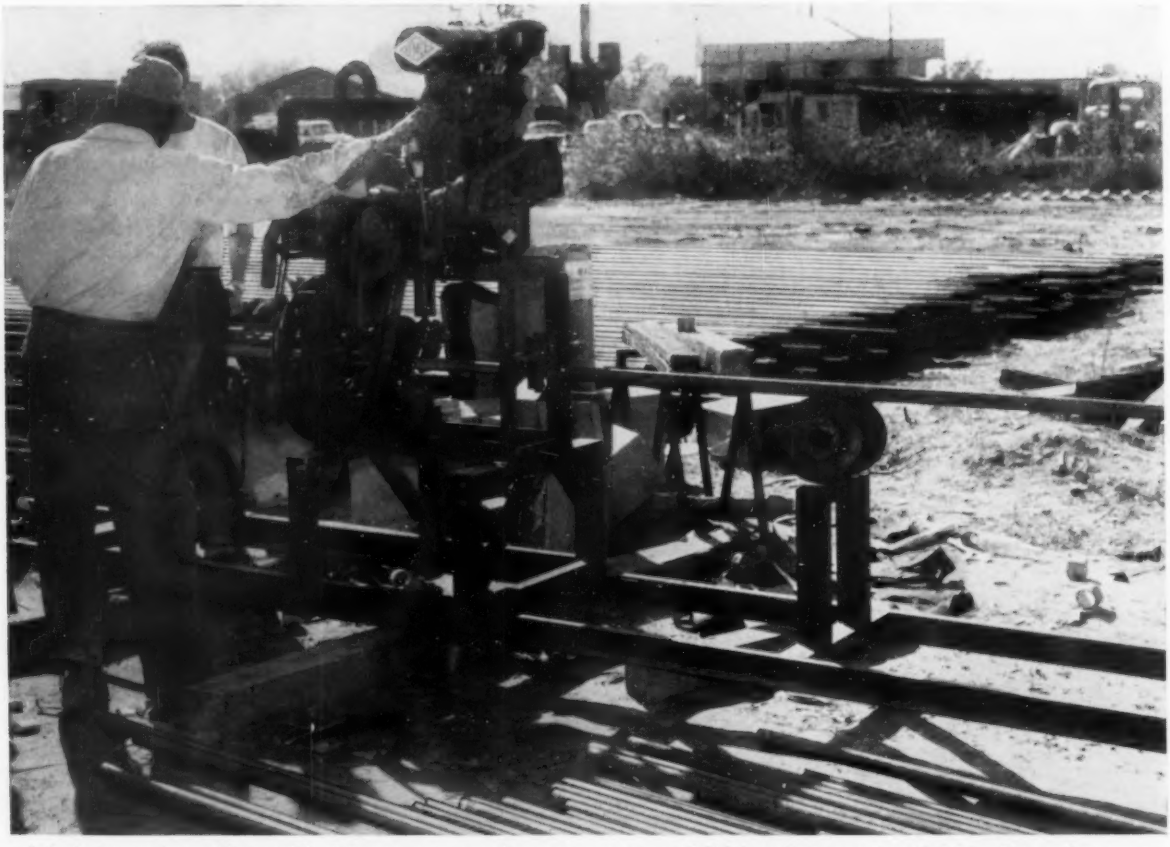
(2) Which anode will do the job with the fewest units? Again, the answer is Galvomag. The extra current supplied by these high-potential anodes means four will do the job of five ordinary anodes in normal soils. Net result: lower installation and replacement costs.

Any of the Dow magnesium anode distributors listed below can give you more information. Contact the one nearest you or write directly to us. THE DOW CHEMICAL COMPANY, Midland, Michigan, Department MA 1429JJ.

Call the distributor nearest you: **Cathodic Protection Service, Houston, Texas • Corrosion Services, Inc., Tulsa, Oklahoma • Electro Rust-Proofing Corp. (Service Division), Belleville, N. J. • Ets-Hokin & Galvan, San Francisco, Calif. • The Harco Corp., Cleveland, Ohio • Royston Laboratories, Inc., Blawnox, Penna. • Stuart Steel Protection Corp., Plainfield, N. J. • The Vanode Co., Pasadena, Calif.**

YOU CAN DEPEND ON DOW

Entire gas distribution system site-wrapped with Polyken tape



A simple, inexpensive, mobile assembly of cleaner, conveyor and wrapper—coats over 10,000 feet of pipe per day with Polyken Tape and overwrap.

Arkansas Louisiana Gas Company chose this method because it's fast . . . it's simple . . . it's sure

While *Polyken* tape is making big-inch pipeline news, gas companies are also finding it ideal for yard or site-wrapping small-diameter pipe in local distribution systems.

Such was the case here, when the Arkansas Louisiana Gas Company used The *Polyken* Method for an entire system including the two cities of Gould and Grady, Arkansas. The installation was made by the Worth James Construction Company, who has used *Polyken* tape on various jobs over the last five years.

In the words of Mr. James, the outstanding feature of this method is that "it eliminates the need for a hot coat plant for small projects."

Tough, durable *Polyken* is applied, as you see, right off the roll—without heat, liquids, solvents or thinners. That saves time, labor and equipment costs. Later, because of the extreme versatility of the tape, welded joints can be simply hand-wrapped.

Want to figure application costs on your job? Write, wire or phone: The Kendall Company, *Polyken* Sales Division, Dept. G-E, 309 W. Jackson Blvd., Chicago 6, Ill. (WEbster 9-7100).

Complete catalog, Sweet's Industrial Construction File, Sec. 31/Ke

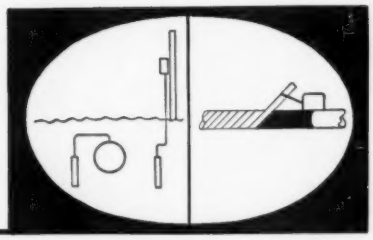
Polyken®

PROTECTIVE COATINGS

THE KENDALL COMPANY
Polyken Sales Division

Corrosion Prevention

DISTRIBUTION • TRANSMISSION



By MARSHALL E. PARKER

Soil resistivity and coating conductance

HOW large a factor in the measured value of the conductance of coating on a buried pipeline is the resistivity of the surrounding soil? There is a common impression that, while soil resistivity is a major factor in the indicated conductance of poor coatings, it is negligible in the case of good coatings. A careful analysis shows that this is not the case. The soil is a major part of the effective electrical behavior of any coating. In fact, for all kinds of coatings now in actual use, it may be said that *the total measured conductance is directly proportional to the mean conductivity of the adjacent soil.*

To see why this is so, it is necessary to take a careful look at the meanings of some of the terms used in the preceding statement. In the first place, what is often referred to as "coating conductance" is actually "leakage conductance to earth" as it is measured, in the field, on existing pipelines. In the laboratory it is possible to determine, by careful techniques, the true conductance of a coating—but only on small and carefully prepared samples. In the field, we measure the total conductance of a circuit which has for one terminal the pipe, and for the other, the earth. Unless we are dealing with a very short section of pipe, we must take into account the fact that our primary terminal, the pipe, is not a simple terminal. It is not all at the same potential, for there is an IR drop along its length.

This is not a simple IR drop, for the "I" term—the current—is not uniform. It varies along the line, from a maximum at the point of drainage. This variation, or attenuation, of the current follows certain mathematical laws. And, it must either be taken fully into account, or approximated by safe methods, in any measurement we undertake.

With the other terminal, the earth, we have even greater difficulties. Obviously there are IR drops in the soil, and obviously they will follow a very complex pattern. Nowhere can we find a simple, identifiable, accessible point of reference. The way out of this dilemma is the adoption, for all studies of the current and potential distribution on and around a pipeline or similar buried structure, of "remote earth" as a conceptual reference point. All of the theory which has been developed in this field is, by mathematical necessity, based on this concept.

But what is "remote earth" and how do we find it in order to place our reference electrodes there? It can only be defined as earth which is so far from the line that further separation would make no appreciable difference in the readings. This is admittedly a rather hazy definition, but it does contain a recognizable and useful idea. One precaution is important. If we are to use this concept, then we must be careful to take steps to exclude from our readings all effects of extraneous currents and potentials in the soil. This can be done by strict reliance, in all cases, on the *method of differences.* When we measure, for example, potentials, we use only the *difference* in potential corresponding to a deliberately introduced *difference* in current.

The use of the remote earth concept, as roughly defined, can be justified by the fact that the measureable effects of all of our work and our experments with pipelines can actually be detected only over a limited area. The precise extent of this area is dependent upon the sensitivity of our instruments, but, for any set of instruments, it is always limited.

The second part of the question can be more simply answered. If we are dealing with good coatings, then we are already electrically remote as soon as we get well outside the coating; an electrode position directly over the line is sufficiently remote, and has some other very real advantages as well.

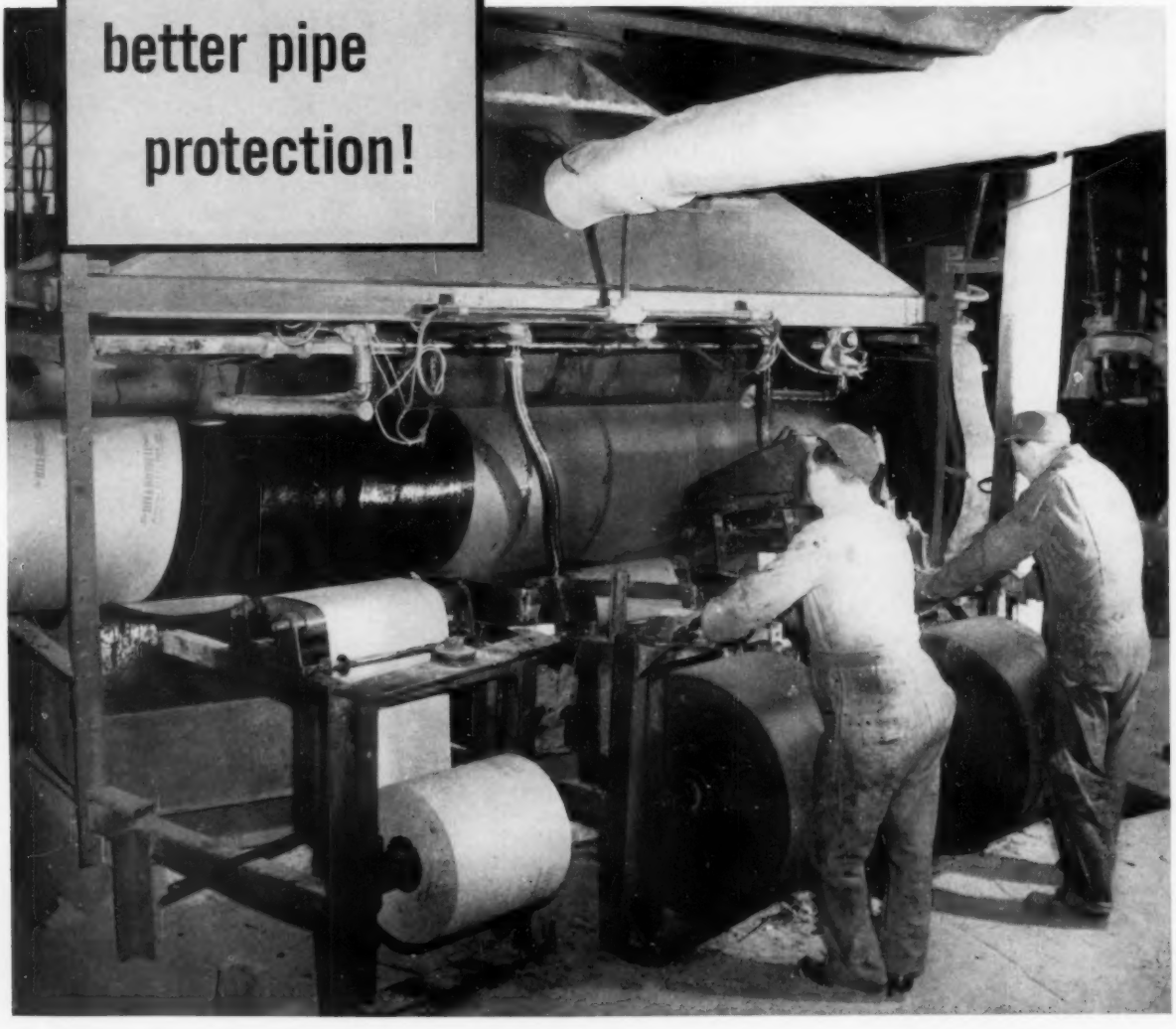
If the conductance measurements were made on *perfect* coating, utterly free from holidays, then we would have a reasonably simple series circuit. Between the pipe and remote earth there are two circuit elements, in series, through which the current must pass. The first of these is the coating. The second is the soil. And, since the current density in the soil falls off very rapidly as we recede from the pipe, the conductivity of the soil will only be important in the immediate vicinity of the pipe. Even a mass of soil which is virtually non-conductive, if not adjacent to the line, can have little effect, because (1) the average current density a few feet away from the pipe is very low, and (2) there is always another path, through more conductive soil, so that the current density through our sandy stratum is even lower than the average.

(*Continued on page* 194)

Here's where the tension mounts...for better pipe protection!

This remarkable machine is one big reason Hill, Hubbell leads in pipe protection. It is synchronized to 1) convey the pipe spirally at uniform speed, 2) apply to it the correct number and thickness of coatings, 3) adjust the overlap of various wrappings and, 4) actually adjust the tension on the wrappings so that the pipe is permanently protected!

This is another first by Hill, Hubbell, another reason to specify Hill, Hubbell wrapped pipe.



Specify Hill-Hubbell wrapped pipe on your next job

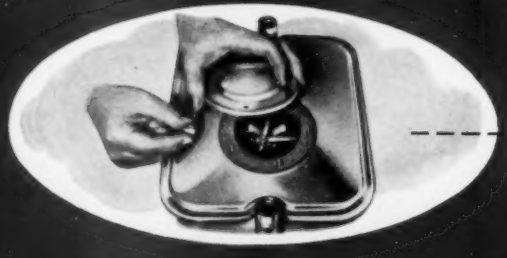
HILL-HUBBELL & COMPANY

DIVISION OF GENERAL PAINT CORP. • 3091 MAYFIELD ROAD, CLEVELAND 18, OHIO

FACTORY APPLICATORS OF COATINGS AND WRAPPINGS

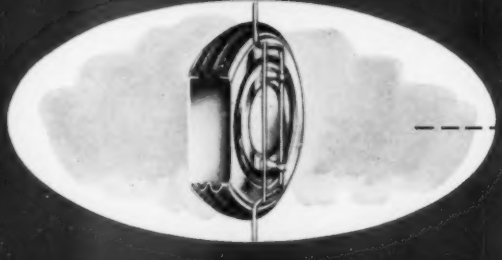
HH

New Advanced Design AMERICAN® "W" series Steelcase Meters



Handcase meter accessibility through easily opened handhole.

Interchangeable index — external and isolated from pressure with gas-tight frictionless rubber grommet drive-shaft seal.



Molded Duramic Diaphragms and Reinforced Flag Rods — provide trouble-free accurate service for entire meter life.

- ★ **Light Weight, Welded Steelcase Construction**
- ★ **Proven Speed Ratio for "Sustained Accuracy"**
- ★ **Long Service Life at Lowest Maintenance Cost**
- ★ **New Lifetime Corrosion Protection Coatings**

And every American meter refinement developed in 120 years of meter engineering.

MODEL W-175

The unusual advantages of this new series by American open entirely new possibilities in meter maintenance and retirement.

W-75 Rated Capacity 75cfh FOB Philadelphia, W-45-LPG Rated Capacity 45*cfh FOB Philadelphia, W-175 Rated Capacity 175cfh FOB Fullerton Calif., W-210 Rated Capacity 210cfh FOB Philadelphia, W-250 Rated Capacity 250cfh FOB Philadelphia, W-300 Rated Capacity 300cfh FOB Philadelphia

*Propane.

Rated capacities based on 0.64 sp. gr. gas at ½-inch pressure drop—5 psi working pressure.

Consult your American Meter representative for full information.

AMERICAN® METER COMPANY
INCORPORATED (ESTABLISHED 1836)

GENERAL SALES OFFICE: Philadelphia 16, Penna.
Albany · Alhambra · Atlanta · Baltimore · Birmingham
Boston · Chicago · Dallas · Denver · Erie · Houston
Kansas City · Los Angeles · Minneapolis · New York
Omaha · Pittsburgh · San Francisco · Seattle · Tulsa · Wynnewood
IN CANADA: Canadian Meter Company, Ltd., Milton, Ontario
Calgary · Edmonton · Regina

SUPPLIERS TO THE GAS INDUSTRY for Ironcase, Tinned Steelcase, Aluminumcase and Welded Steelcase Meters • American-Westcott Orifice Meters • Instruments • Reliance Regulators • Apparatus • Valves

There's less chance for leaks with U-BRAND Reducing Nipples

You cut cost . . . speed assembly, too!

When you're reducing line size, you make fewer connections for faster assembly with U-Brand reducing nipples. This means less chance for leaks. You cut installation cost, too. Single reducing nipples cost less than a reducer or bushing and regular nipple.

Swaged from new, mill-tested steel pipe, U-Brand reducing nipples are a single leak-proof unit. True threads and clean outside chamfer speed installation. Available in black or galvanized finish, there are five convenient sizes ¾″ x ½″, 1″ x ¾″, 1¼″ x 1″, 1½″ x 1¼″, and 2″ x 1¼″.

If you're interested in saving time and cutting costs, try U-Brand reducing nipples on your next job. Order some from your supply house today.

A single source for all your pipe fitting needs

Galvanized and Black U-Cote Malleable Iron Pipe Fittings—Unions—Plugs and Bushings—Cast Iron Drainage and Screwed Fittings—Steel Nipples and Couplings—Insert Fittings for Plastic Pipe.

U-BRAND

The Union Malleable Manufacturing Company
Ashland, Ohio

YOU NAME THE JOB!

HOPTO MODEL 360 57-90—Big-capacity 90 GPM triple tandem pump and split hydraulic system handles half-yard backhoe. Full 360° continuous swing from over cab position.

HOPTO MODEL 200 DTM 57-72—Split hydraulic system with 72 GPM triple tandem pump handles up to 30" backhoe. Offers 200° continuous swing.

Heaviest-duty, Largest GPM Hydraulic System Available

THERE'S A

HOPTO®

MODEL FOR IT

HOPTO MODEL 190 SPC—Complete self-propelled track unit handles up to 30" backhoe. 190° continuous swing.

HOPTO MODEL 80 CTM—A HOPTO unit adapted for quick attachment to crawler tractors. 180° continuous swing.

HOPTO MODEL RTM—A HOPTO designed for mounting on rubber tired tractors. Handles up to 30" buckets, 180° continuous swing. Front end loader mounts directly on HOPTO frame.

HOPTO TRAILER MODEL—Available in self-powered or PTO-drive models. Offers 180° continuous swing, all around utility at low cost.

GET THESE HOPTO ADVANTAGES:

- Fast-cycling, completely hydraulic operation—no clutches, brakes, drums or cables.
- Simple, feather-touch hydraulic controls.
- Rugged hydraulic systems with generous overload factors, large oil reservoirs, heavy-duty pumps and valves.
- Wide selection of interchangeable backhoe or shovel buckets, log grapples, magnets or crane attachments.

STILL MORE MODELS

HOPTO offers 3 models for truck mounting, self-powered or PTO-drive trailer models, and the self-propelled rubber-tired Model SPR.

Write today for complete information or see your HOPTO Dealer!

BADGER MACHINE COMPANY

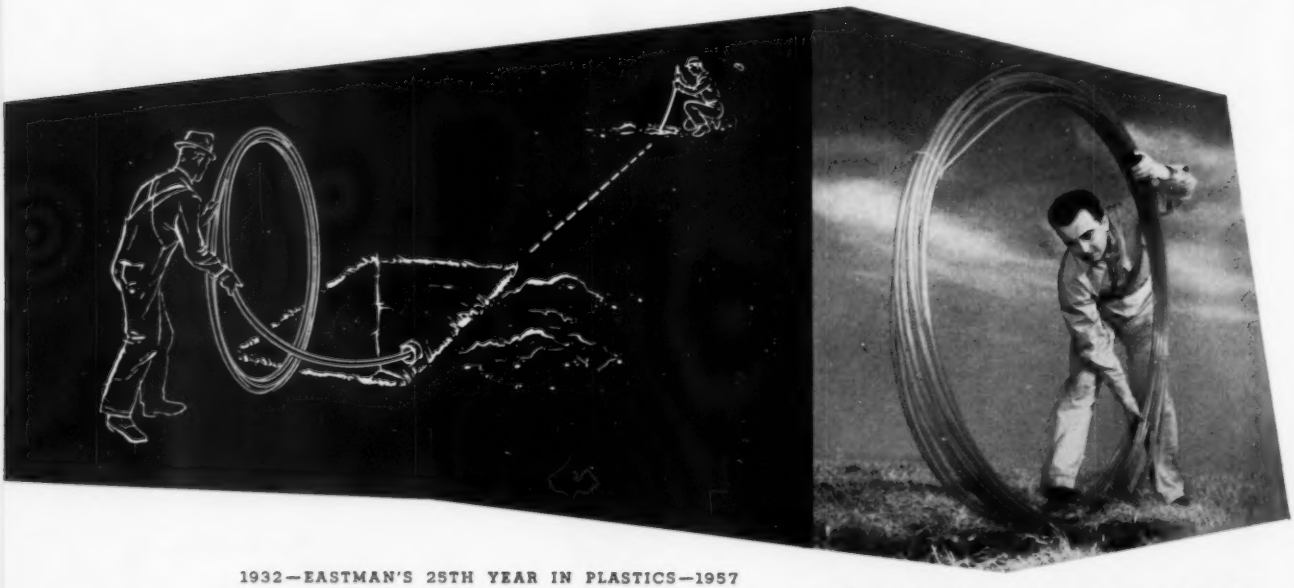
DEPT. 29 • WINONA, MINNESOTA

Modern method of service replacement

There's no trenching with tubing of Tenite Butyrate

Plastic tubing of Tenite Butyrate is the fast, economical way to replace corroded metal services. Trenching is eliminated. You merely dig two holes: one at the gas main tap, the other at the service riser. Tubing of Tenite Butyrate is then run right through the old pipe. Since its smooth walls create less friction than metal tubing, pressure is unaffected by the resulting slight decrease in diameter.

Tubing made of Tenite Butyrate has other advantages too: It is amazingly light in weight; an average service of 70 feet weighs less than four pounds. Connections are made between tubing and metal pipe



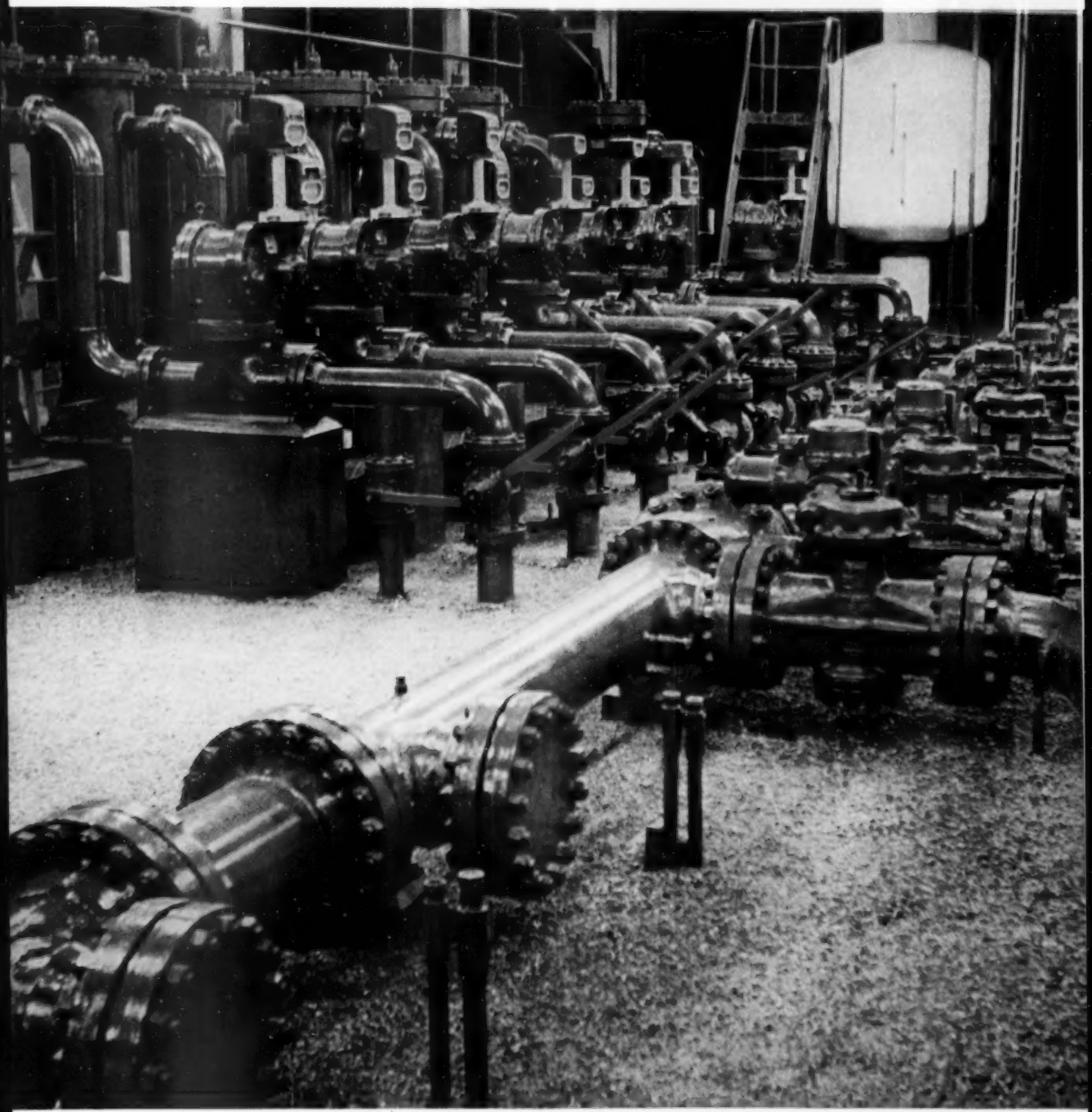
1932—EASTMAN'S 25TH YEAR IN PLASTICS—1957

with simple adaptors. What's more, the tubing is unaffected by corrosive or electrolytic action of soil—your assurance of many years of trouble-free service.

Over a decade of use has proved the many advantages of Butyrate over metal for natural gas service. Nearly three million feet of this plastic tubing have already been installed by one company alone. *Tenite Butyrate has also been used by several progressive utilities as a material for mains.* Find out more about this modern approach to natural gas distribution. For information about tubing made of Tenite Butyrate, its fittings and installation, plus the names of suppliers near you, write: EASTMAN CHEMICAL PRODUCTS, INC., subsidiary of Eastman Kodak Company, KINGSPORT, TENNESSEE.

A 16mm. sound-color film, "Plastic Pipelines," is available upon request.

TENITE
BUTYRATE
an Eastman plastic



COMPACT DESIGN SAVES MONEY when you specify Rockwell-Nordstrom valves for tight manifolds like at the pipeline station above. (Rockwell Rotocycle meters are also shown.) Most Rockwell-Nordstrom valves take little more area than the diameter of the flanges—there are no bulky rising stems or cumbersome bonnet cavities. And less bulk means less weight too; that's another cost cutting bonus you gain for intricate piping arrangements in modern process plants.

You'll also save product loss and contamination because Rockwell-Nordstrom valves are lubricant sealed to be truly leakproof and to shut-off positively. From every standpoint, Rockwell-Nordstrom valves cost less to use and perform better. And they cost no more to buy, often less, than ordinary valves. Rockwell Manufacturing Company, Pittsburgh 8, Pa.

Available at leading suppliers . . . everywhere.

ROCKWELL-
Nordstrom
VALVES

Lubricant Sealed For Positive Shut-Off

Newly designed **SKINNER-SEAL**

SENTINELS . . . These Rockwell-Nordstrom valves stand always ready for fast, easy operation. No matter how long a Rockwell-Nordstrom valve has been in open or closed position, *operation is instant.* Why? Pressurized lubricant in the exclusive Sealdport* system acts as an hydraulic jack to keep the plug free for smooth, easy quarter-turn operation and the same pressurized lubricant forms a lasting, *double seal* against leakage of lightest gases or heaviest slurries.

Where your valves must be sentinels against trouble . . . year after year . . . specify Rockwell-Nordstrom valves. They cost no more to buy, often less, than ordinary valves. Their dependability has been proved through forty years of exceptional performance in every industry. Rockwell Manufacturing Company, Pittsburgh 8, Pa. *Registered trade mark Rockwell Manufacturing Company.

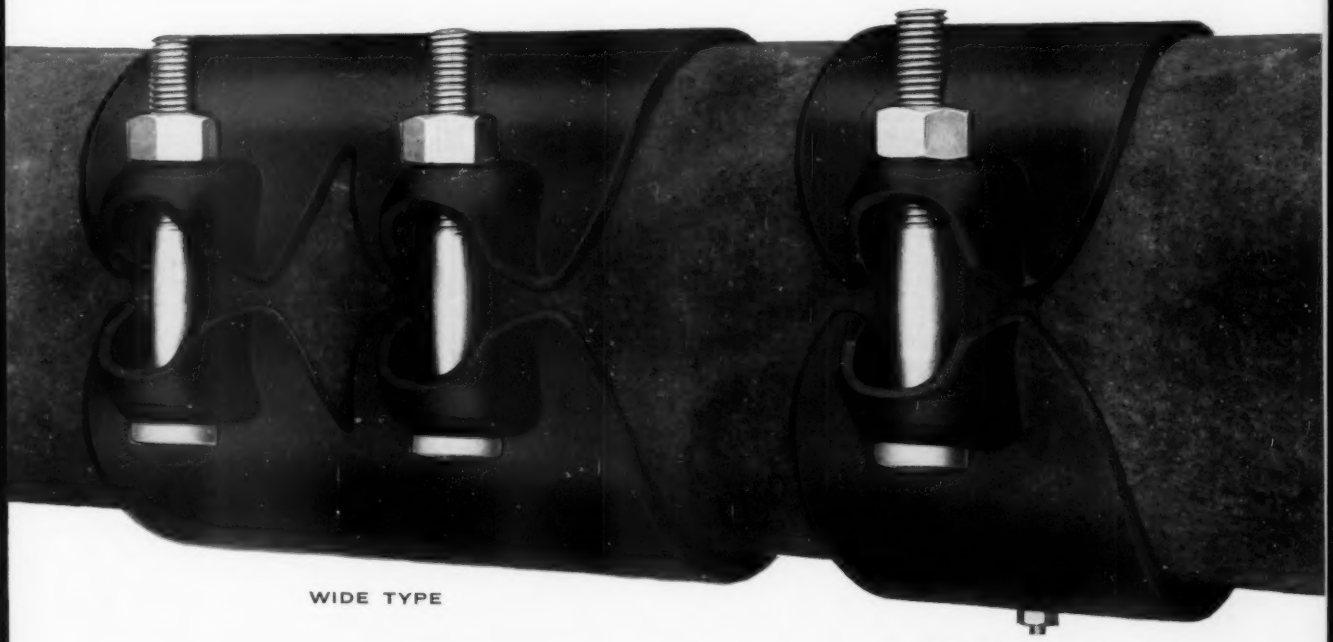
Available at leading suppliers . . . everywhere.

ROCKWELL-
Nordstrom
VALVES

Lubricant Sealed for Positive Shut-Off

Newly designed **SKINNER-SEAL**

PRESSED STEEL ECONOMY CLAMP



WIDE TYPE

NARROW TYPE

For Repairing Badly Pitted or Corroded Pipe

A radical improvement in design, together with a new manufacturing process is announced for the Skinner-Seal Pressed Steel Economy Clamp. This clamp—for repairing rust holes and corrosion spots in pipe lines—is now cold-formed on a 500 ton press. Note new heavily reinforced, "closed" lug construction. These lugs are not welded to the clamp but formed from the material itself.

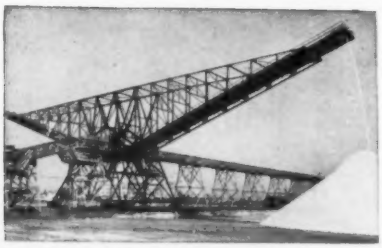
Also width of both clamps has been increased. The NARROW is now 4″ wide instead of 3½″. The WIDE is now 8¼″ wide instead of 6½″. The same heavy 3/16″ stock is used as before, but owing to the new lug design, clamp has been immeasurably strengthened.

Sizes start at 4″ O.D. and run through all standard steel pipe and also cast iron pipe sizes up to 24″ O.D.

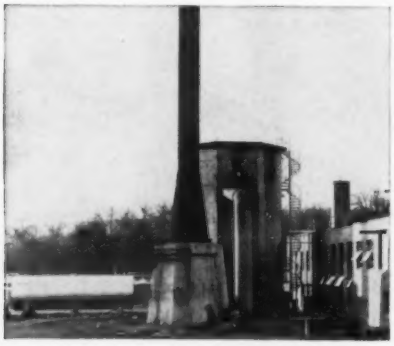
M. B. SKINNER COMPANY, SOUTH BEND 21, IND., U. S. A.

WRITE FOR CATALOG GW

SKINNER-SEAL PRESSED STEEL ECONOMY CLAMP



19 Years of Protection were given this giant gantry crane at a salt-producing plant by a coating system of Bitumastic Super Service Black. Exposed to the corrosive combination of salt plus atmospheric moisture, the coating system has required only minor touch-up during this service.



High Temperature Stack is protected against corrosion by a coating of Bitumastic® Hi-Heat Gray, a zinc-base coating designed for high-temperature protection. Intermittent temperatures up to 1000° F. and continuous 800° F. dry heat will not affect this coating material, and it is widely used for protection of boiler breeching, stacks and other hot metal surfaces.

GET YOUR COPY of this new booklet on Bitumastic protective coatings. Use coupon below.

Koppers Company, Inc.
Dept. 117E
Pittsburgh 19, Pa.

Please send me "For Lasting Protection Against Corrosion . . ."

Name_____

Company_____

Address_____

City_____ State_____

how to
CUT CORROSION LOSSES
a report by Koppers Company, Inc.

Russell C. Stromquist
Corrosion Consultant

Recently, we were asked to recommend protective coatings in a plant on the West Coast. In analyzing their coating and enamel needs, we did our usual survey of the installation. After the survey, the customer's Chief Engineer remarked, "You fellows certainly go to a lot of trouble just to tell us what coating system we should use."

We do—because we know it is good for our customers and, therefore, good for us. Case history records prove clearly that careful study *before* making recommendations insures a better protective coating job at lower annual cost. In analyzing protective coating needs, our corrosion engineers follow a "pre-coating check list" based on experience on thousands of jobs.

* * *

The first step in the pre-application survey is a study of the environment. Specifically, you should always take into account the corrosive atmosphere: such factors as acid fumes, intense sunlight, salt air, etc. Physical environment—exposure to abrasion or impact—also plays an important part in the selection of an effective coating system.

The extent of temperature variation and expected minimum-maximum temperatures are important considerations, since the coating chosen must (a) resist low-temperature embrittlement, (b) resist high-temperature flow and (c) harden properly at service temperature.

The moisture environment too, is important in selecting protective coatings. Besides necessary water resistance, the coating should stand-up under pronounced wet-dry cycles.

A thorough cost analysis is a vital part of any pre-coating survey. Many factors are involved, varying in importance with the specific application. For example, total coating cost—made up of surface preparation and application costs—must be balanced against the cost of periodic maintenance. In some cases, the coated surfaces will not be accessible and coating-life will be a *direct* measure of the life of the material.

The cost of probable shut-down or loss of production time is perhaps one of the most important evaluations that must be made in intelligent selection of corrosion-preventing coating systems. Often, it outweighs the direct replacement costs of materials to be protected.

* * *

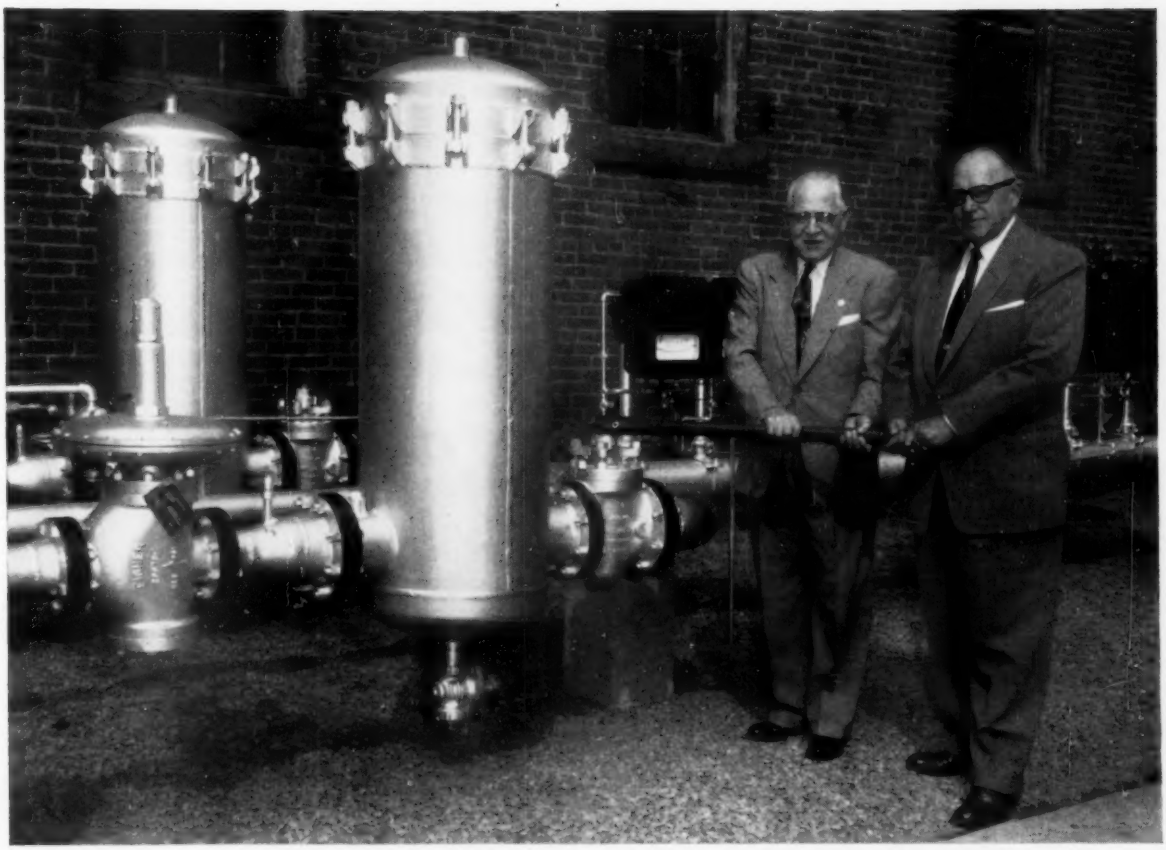
This pre-coating check list, detailing the protection required and under what circumstances, is a key factor in the exceptional performance of Bitumastic® coatings. Such thoroughness sometimes leads us to willingly recommend some material other than one of Koppers eleven basic Bitumastic coatings to solve a customer's problems.

* * *

In the next report, we will discuss why surface preparation is so vital to the life and economy of any protective coating. Meanwhile, we'd like to hear about your corrosion problems. Koppers Company, Inc., 1300 Koppers Bldg., Dept. 117E, Pittsburgh 19, Pa. District Offices: Boston, Chicago, Los Angeles, New York, Pittsburgh and Woodward, Ala.

KOPPERS

BITUMASTIC
REG. U. S. PAT. OFF.
COATINGS AND ENAMELS



Charles H. Gueffroy, left, president of Portland Gas & Coke Co., and Carl E. Braun, vice-president and manager of Publishers Paper Co., Oregon City, Ore., "turn on the gas" at latter's plant. In foreground are two 6-inch Staynew filters, Model CPHG-10030, part of a large purchase by Portland utility.

Portland Selects Staynew Filters

for Natural Gas Piped from New Mexico

A spectacular 1,500-mile pipeline, bringing natural gas from New Mexico to Portland, Ore., promises a great new source of thermal energy to industries looking for locations, as well as savings of hundreds of thousands of dollars yearly to home gas users.

Portland Gas & Coke Co., which has been in business nearly 100 years, made a rewarding installation of Staynew filters in 1954, and, as a consequence, selected Staynew to filter much of its new supply of natural gas. Staynew filters purchased by the Portland utility in 1956 alone, it is conservatively estimated, are now filtering 25,000,000 scfd. It is also believed that more than 2,000,000 scfd are being filtered into homes by the new Staynew Model CPHB home gas filter.

Whatever *your* filtering problem, there is a Dollinger representative nearby, ready to help you solve it. Write Dept. 68, Dollinger Corporation, 3 Centre Pk., Rochester 3, N. Y.

PROTECTOMOTOR U.S. PAT. OFF.

STAYNEW **DOLLINGER**

FILTERS

LIQUID FILTERS • PIPE LINE FILTERS • INTAKE FILTERS • HYDRAULIC FILTERS • ELECTROSTATIC FILTERS • MIST COLLECTORS • DRY PANEL FILTERS • SPECIAL DESIGN FILTERS • VISCOUS PANEL FILTERS • LOW PRESSURE FILTERS HIGH PRESSURE FILTERS • AUTOMATIC VENTILATION FILTERS • NATURAL GAS FILTERS • SILENCER FILTERS

prompt service

from any of our convenient warehouse locations

in one-half pound cans to tank wagons,
delivered in our own equipment
by our own experienced drivers.

NATURAL GAS ODORIZING, INC.

P. O. BOX 15252 / HOUSTON 20, TEXAS

JAEGER'S 50 CFM MORE AIR SPEEDS RUSH WORK

By producing 365, not 315, cfm of 100 lb. air, this Jaeger Rotary is operating six 80 lb. breakers at full efficiency to finish a rush job in busy Benjamin Franklin Parkway, Philadelphia. Full load speed only 1700 rpm.

FULL AIR PRESSURE AT 5200′ ELEVATION

Installing cable for Denver, Colorado utility, this Jaeger "125" Rotary is holding full pressure in two Thor heavy duty breakers. Full load speed is only 1700 rpm. Jaeger originated the 125 cfm compressor rating.

JAEGER'S 125 AND 250 CFM SIZES ON 2-WHEELS

Jaeger 125 and 250 rotaries give you the advantages of Jaeger's higher efficiency (1700 rpm full load speed instead of 1800-1950), plus full size tool boxes, retractable pneumatic-tired dolly wheel and 8-hour fuel tanks, with 2-wheel mounting. Four-wheel units are available in 365 and 600 cfm sizes.

Your Jaeger distributor will gladly give you full details and demonstration — or let us send you Catalog JCR-5.

THE JAEGER MACHINE COMPANY

661 Dublin Avenue, Columbus 16, Ohio

Jaeger Machine Co. of Canada, Ltd., St. Thomas, Ontario

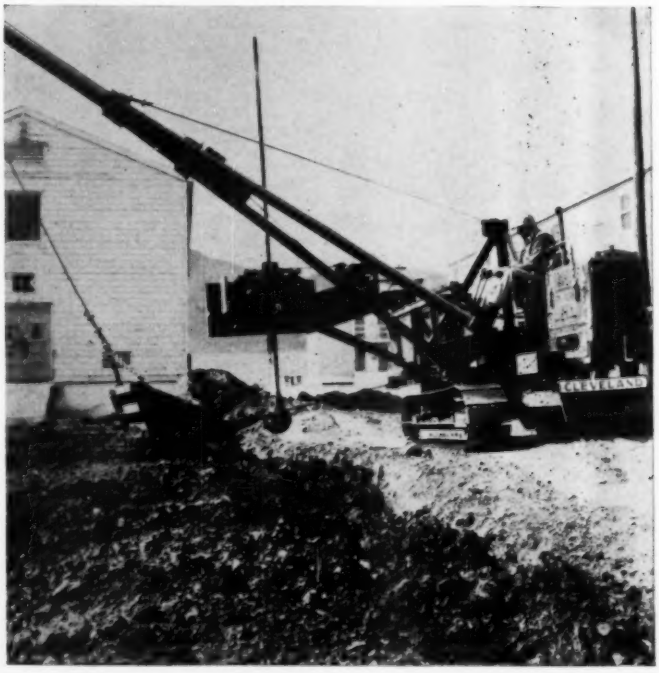
The CLEVELAND 80W replaces 6 men, 4 machines

...and does the job in half the time!

Don Rogers, superintendent of Charles Ramsey and Company of Fort Carson, Colo. has this to say about the performance of his new Cleveland Model 80W on a job of backfilling and compacting trench for the U. S. Army at Camp Carson:

"On this job, the 80W has replaced a large tractor, a 210 cu. ft. air compressor, two triple tampers and 6 men, and is doing the job in half the time."

"I'm paying this machine the supreme compliment of saying that it is the only machine I have ever seen that puts the dirt back in the ground as well as a Cleveland 140 trencher takes it out."



The CLEVELAND 80W

A SIDECRANE

- Lays Pipe — 30,000 ft. lb. capacity
- Power Boom — Up and Down
- 4 Line Speeds
- Long Reach — 21 Feet
- Sets Bends, Valves
- Unloads — Strings — Pulls Sheathing, etc.

A BACKFILLER

- 4½ Foot Scraper Board
- Backfills Clean
- Backfills Fast — 20 Passes Per Minute
- Stays Off Completed Work
- Backfills from Either Side of Trench
- Works Safer — Parallels Work
- Fits All Job Conditions

A TAMPER

- Fills and Tamps Simultaneously
- Meets Density Specifications
- Tamps From The Bottom Up
- Parallels Work — No Straddling
- Tamps Wider — Tamps Safer

ONE MACHINE...ONE OPERATOR...DOES IT ALL

Good Everywhere ®

THE CLEVELAND TRENCHER COMPANY

20100 St. Clair Avenue • Cleveland 17, Ohio

News about

B.F.Goodrich Chemical *raw materials*

Several manufacturers offer rigid vinyl pipe and fittings made from Geon. Sizes range from ¼ inch for instrument air lines up through 12 inches. Fittings are socket or threaded. Vinyl is normal or high impact.

with light-weight Geon rigid vinyl pipe...

two men can lay a mile pipeline in 8 hours

BECAUSE rigid vinyl pipe made from Geon is light in weight, and easy to handle, cut and join, two men can lay a mile of three inch Geon pipeline in eight hours. A similar lay with metal pipe would take 24 to 30 hours while a mile lay with cement-lined pipe would take some 80 hours.

On typical pipe laying jobs, joining takes less than a minute per section. While one man positions the pipe and cleans dirt and moisture from both pipe ends, the other brush-applies solvent cement. Then, the two men push two pipes together in a slip-sleeve fitting.

Along with this installation simplicity, you enjoy these outstanding benefits with pipe of rigid Geon.

- **It possesses high tensile and impact strength.**
- **It is non-corrosive and highly resistant to oil, acids, alkalis and most chemicals.**
- **Its smooth internal surface reduces flow resistance and inhibits the build-up of deposits.**

For handling sour crude oil, salt water, corrosive fumes and countless other applications, Geon vinyl pipe is ideal. It produces appreciable dollar-savings through lower material, freight and labor costs and added years of maintenance-free service.

To get full details on the properties of rigid Geon compounds 8700A and 8750, write Dept. FO-3, B. F. Goodrich Chemical Company, 3135 Euclid Ave., Cleveland 15, Ohio. Cable address: Goodchemco. In Canada: Kitchener, Ontario.

B.F.Goodrich Chemical Company
a division of The B.F.Goodrich Company

B.F.Goodrich GEON polyvinyl materials • HYCAR American rubber and latex • GOOD-RITE chemicals and plasticizers • HARMON colors

Meter installation. With its 4-wheel drive traction, the Universal 'Jeep' goes anywhere—through mud, sand and fresh fill—to deliver men, tools and equipment to the job. In new construction areas, the 'Jeep's' extra traction is your assurance that installation and service are always on schedule.

Only 4-Wheel-Drive 'Jeep' vehicles fit so many gas service needs!

Trenching. Digging trenches for service lines is a fast, efficient operation with this 'Jeep'-propelled trencher. It digs up to 800 feet per hour and up to 14 inch widths and 6 foot depths—travels speedily between jobs.

All-New Forward Control 'Jeep' FC-150 Truck. It's the first time a 4-wheel drive truck has so effectively combined so much cargo capacity (74-inch pickup box), with such exceptional maneuverability (81-inch wheelbase).

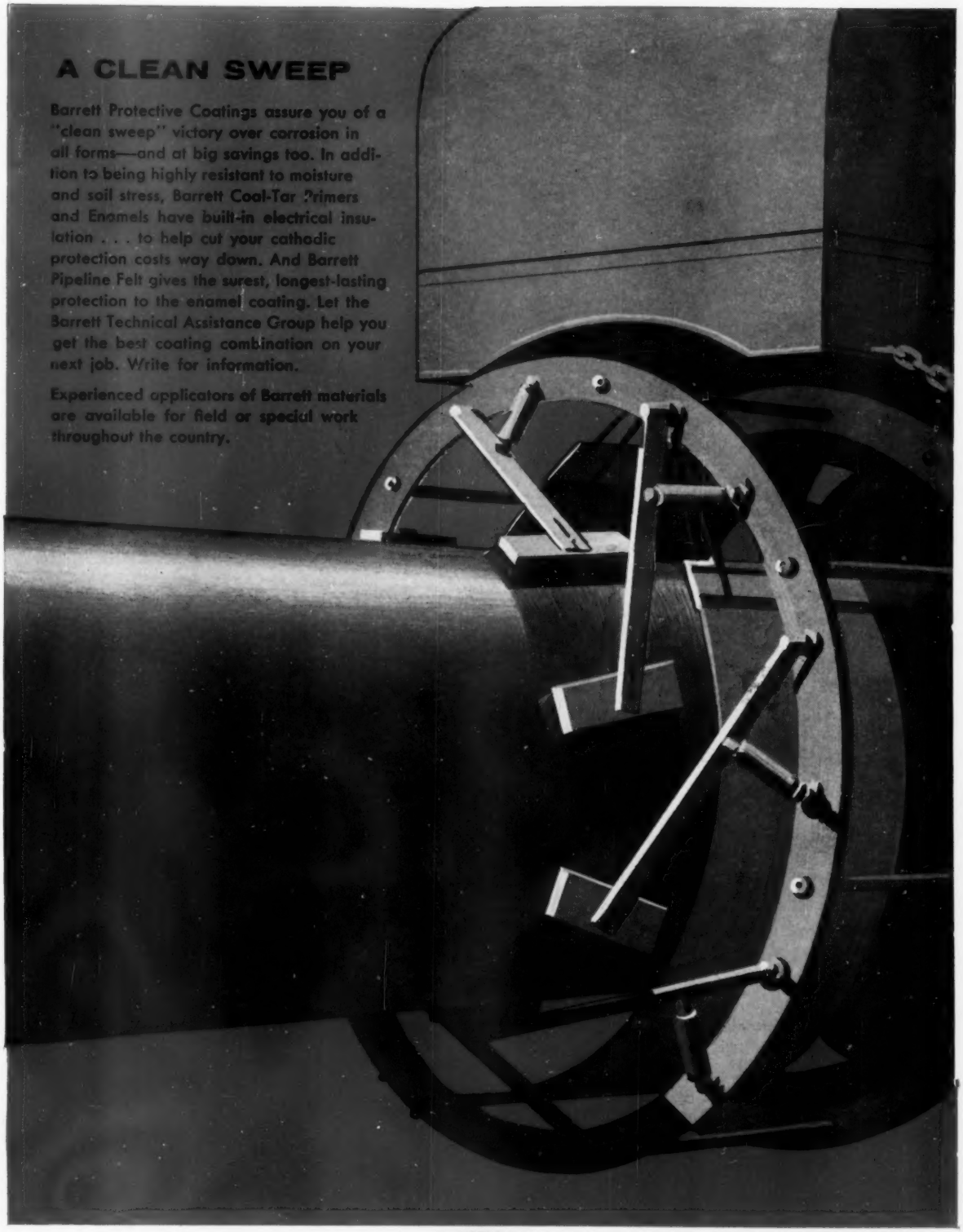
Whether it's following a pipeline cross-country or transporting men and supplies to new construction areas, 'Jeep' 4-Wheel-Drive vehicles are proving their value every day in virtually every phase of the gas industry. With the extra traction of their 4-Wheel-Drive, they go almost anywhere: deliver men, power and tools in emergencies—speed over roads or patrol where there are no roads—through mud, sand, snow or up rocky grades. They shift quickly into conventional 2-wheel drive for travel at highway speeds. And with power take-off they operate welders, compressors, generators and other special equipment. See your Willys dealer for a demonstration, or write for information.

The 'Jeep'®

family of 4-Wheel-Drive vehicles

WILLYS... makers of the world's most useful vehicles

WILLYS MOTORS, INC., TOLEDO 1, OHIO


A CLEAN SWEEP
Barrett Protective Coatings assure you of a "clean sweep" victory over corrosion in all forms—and at big savings too. In addition to being highly resistant to moisture and soil stress, Barrett Coal-Tar Primers and Enamels have built-in electrical insulation . . . to help cut your cathodic protection costs way down. And Barrett Pipeline Felt gives the surest, longest-lasting protection to the enamel coating. Let the Barrett Technical Assistance Group help you get the best coating combination on your next job. Write for information.
Experienced applicators of Barrett materials are available for field or special work throughout the country.

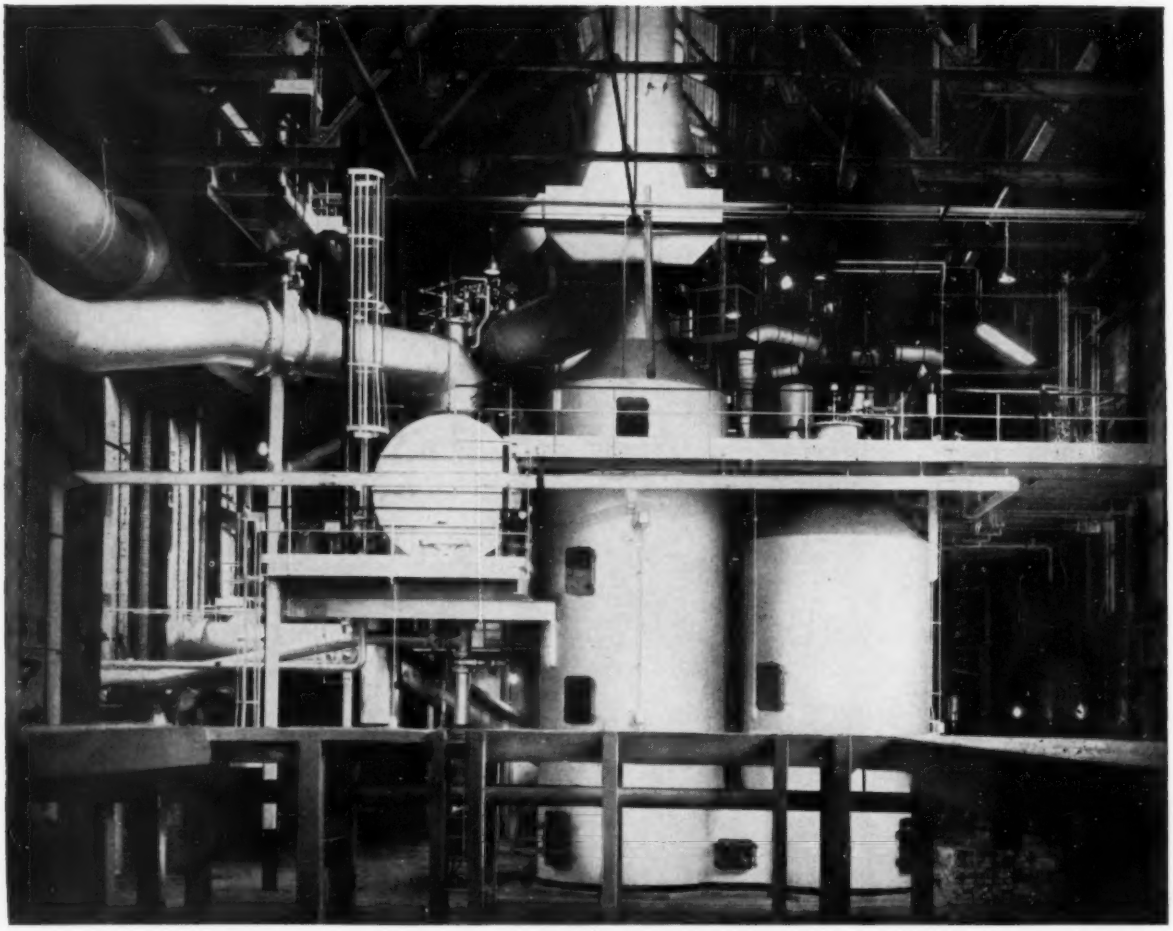
Barrett®

PROTECTIVE COATINGS

BARRETT DIVISION, Allied Chemical & Dye Corporation, 40 Rector Street, New York 6, N.Y. In Canada: The Barrett Company, Ltd., 5551 St. Hubert Street, Montreal, Que.

OVER 100 YEARS OF EXPERIENCE

Allied Chemical



U.G.I. 13 ft. Oil Gas Apparatus, located at Station "A" Plant. Philadelphia Gas Works Division of The United Gas Improvement Company.

U.G.I. equipment GREATER UNIFORMITY OF OIL GAS AND TAR with U.G.I. 4-Shell Regenerative Type Oil Gas Set

The U.G.I. design of 4-shell regenerative type oil gas apparatus for the Hall Process of the American Gas Association provides special features and control equipment that have proved successful in adding to the efficiency and ease of operation and in securing greater uniformity in the quality of the oil gas and tar produced.

This set, shown above and located at Philadelphia, Pa., is operated for peak loads. It has successfully used heavy oils with up to 15% Conradson carbon content. It has produced, with a good grade of diesel oil, over 9000 Mcf per day of 1000 Btu gas.

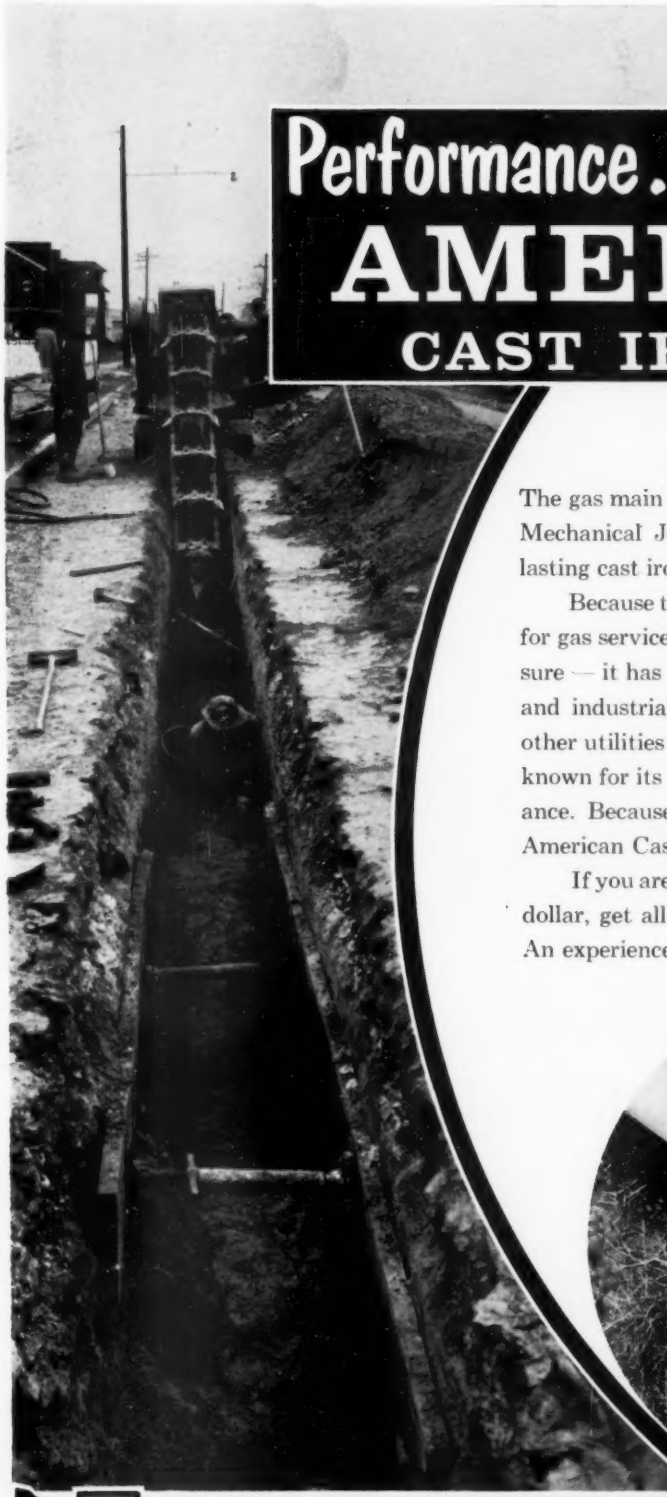
United Engineers offers complete facilities for the design, construction and operation of oil gas handling and treating apparatus in addition to the production apparatus. Each oil gas installation made reflects our extensive experience in the development of oil gas and closely related processes and equipment. Why not investigate and profit from this experience.

UNITED ENGINEERS

& Constructors Inc

U.E.&C. (Canada) Ltd.

New York 17 • PHILADELPHIA 5 • Chicago 2



Performance... under pressure

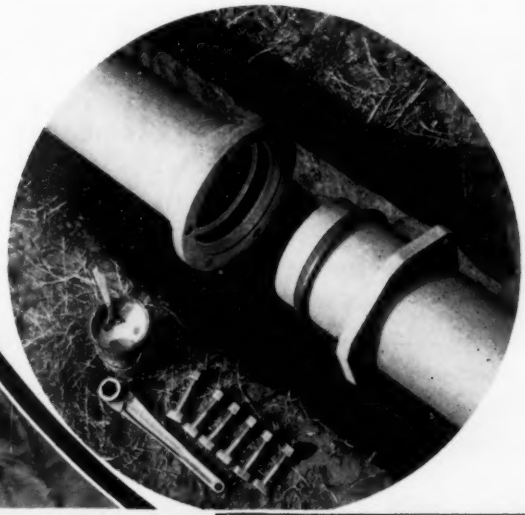
AMERICAN

CAST IRON PIPE

The gas main being installed here is American Double-X Mechanical Joint Pipe . . . bottle-tight, rugged, longer-lasting cast iron pipe.

Because the Double-X Joint was specifically designed for gas service — engineered for performance under pressure — it has been the choice for thousands of municipal and industrial gas installations. In these, as well as in other utilities and industries, American Cast Iron Pipe is known for its record of dependable, trouble-free performance. Because its annual cost has proven to be lower, American Cast Iron Pipe is also known for its economy.

If you are under pressure to get the most for your pipe dollar, get all the facts about American Cast Iron Pipe. An experienced representative is as close as your phone.

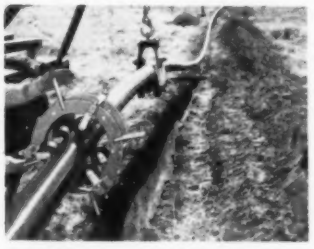


AMERICAN
CAST IRON PIPE CO.
BIRMINGHAM 2, ALABAMA

SALES OFFICES
Kansas City • Minneapolis
Dallas • Orlando
Pittsburgh • Cleveland
New York • Chicago • Denver
Los Angeles • San Francisco

Look what you can do with "SCOTCHRAP"!

54-INCH circulating water lines are easily protected against corrosion by wrapping with wide-width "SCOTCHRAP." Tape is clean, easy, safe to use; no heat or special equipment necessary.



QUICK, easy application of "SCOTCHRAP" to long lines of welded pipe expedited by use of Betzel "Tapester." Permits continuous insulating with smooth, tight result.

TOUGH "SCOTCHRAP" easily withstands abrasions of rough fill. In event of tearing or accidental rupture, simple patch repairs the damage. For further information, write 3M Co., St. Paul 6, Minn., Dept. CT-57.

Sticks at a touch to curves and contours

Irregular fittings on small pipes of mixed diameters are easily wrapped with the proper widths of "SCOTCHRAP." This smooth, tough tape conforms tightly to elbows, flanges, and welded beads, as well as long lengths in all diameters. Pressure-sensitive "SCOTCHRAP" is super-strong polyvinyl chloride plastic tape in rolls. Available in seven standard widths from 1 to 18 inches. *"The quality pipe protection that rolls on dry."*

Reg. U.S. Pat. Off.

SCOTCHRAP

BRAND

PIPE INSULATION

The term "SCOTCHRAP" is a registered trademark of Minnesota Mining and Manufacturing Co., St. Paul 6, Minn. Export Sales Office: 99 Park Ave., New York 16, N.Y. In Canada: P.O. Box 757, London, Ontario.

PRODUCT OF 3M COMPANY RESEARCH

Protective odor in nature or in industry is a valuable safety device . . . if it is "pin-pointed" for immediate location and prompt action.

'Sharples' brand SPOTLEAK® 1009 outshines the skunk in announcing itself, and in directing prompt attention to the danger spot in a leaky pipeline or gas main. This outstanding odorant offers these exclusive advantages:

- • its odor is far-reaching and unmistakable.
- • it guarantees 80% minimum tertiary butyl mercaptan content.
- • it assures less oxidation loss, and delivers more odorant AT THE END OF THE LINE.
- • it offers the greatest possible uniformity and stability, at the lowest price for a quality odorant.
- • it possesses the highest perceptible and warning level of mercaptans, introducing definite and continuous protection.

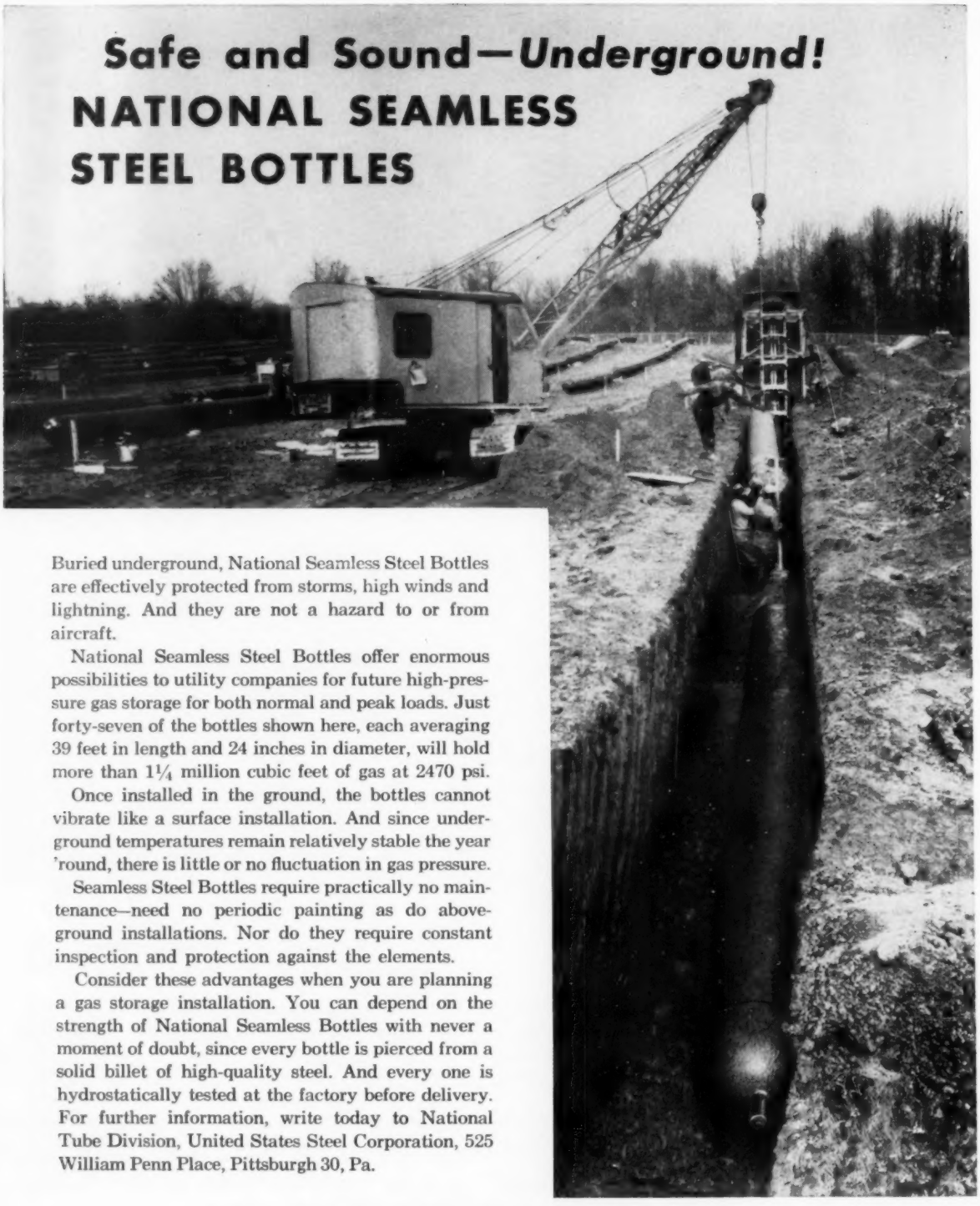
Pipeline companies and natural gas distributors can't afford to gamble with the safety of their customers and communities. Put SPOTLEAK 1009 through the paces and you'll know what adequate, low cost odorization really means! Our descriptive literature—Catalog S-115-5C—gives you the facts you want.

Pennsalt Chemicals

INDUSTRIAL DIVISION
PENNSALT CHEMICALS CORPORATION
3 Penn Center, Philadelphia 2, Pa.
New York • Pittsburgh • Cincinnati • Akron • Chicago
Appleton • Detroit • St. Louis • San Francisco • Los Angeles
Pennsalt of Canada: Hamilton, Ontario

Safe and Sound—*Underground!*

NATIONAL SEAMLESS STEEL BOTTLES



Buried underground, National Seamless Steel Bottles are effectively protected from storms, high winds and lightning. And they are not a hazard to or from aircraft.

National Seamless Steel Bottles offer enormous possibilities to utility companies for future high-pressure gas storage for both normal and peak loads. Just forty-seven of the bottles shown here, each averaging 39 feet in length and 24 inches in diameter, will hold more than 1¼ million cubic feet of gas at 2470 psi.

Once installed in the ground, the bottles cannot vibrate like a surface installation. And since underground temperatures remain relatively stable the year 'round, there is little or no fluctuation in gas pressure.

Seamless Steel Bottles require practically no maintenance—need no periodic painting as do above-ground installations. Nor do they require constant inspection and protection against the elements.

Consider these advantages when you are planning a gas storage installation. You can depend on the strength of National Seamless Bottles with never a moment of doubt, since every bottle is pierced from a solid billet of high-quality steel. And every one is hydrostatically tested at the factory before delivery. For further information, write today to National Tube Division, United States Steel Corporation, 525 William Penn Place, Pittsburgh 30, Pa.

NATIONAL TUBE DIVISION, UNITED STATES STEEL CORPORATION, PITTSBURGH, PA.
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO, PACIFIC COAST DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

USS

National Seamless Steel Bottles

WALLS WITHOUT WELDS

UNITED STATES STEEL

Make Dependable Gas Service Connections

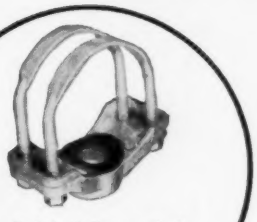
FAST... with DRESSER SERVICE SADDLES

HEAVIER DESIGN — Bodies are ruggedly constructed from Grade A malleable iron with reinforced sections for extra strength.

FULL TAPPING RANGE — Available with IPS Thread taps to 2″ in size. Extra large boss insures obtaining full threads.

EXTRA-WIDE, FLAT STEEL STRAPS — Forged, high-tensile steel straps are accurately shaped to conform to the outside of the pipe. Wide, flat surfaces prevent cutting or crushing of pipe.

FIT FULL RANGE OF PIPE — Dresser Service Saddles fit steel or cast-iron pipe where the OD falls within the size range marked clearly on each saddle.



Gasket of Dresser Grade 27 compound is securely cemented in place for easy installation.

Dresser Service Saddles are available in single or double strap designs.

For service connections that go in fast and easy, and give generations of dependable service, it pays to use Dresser Service Saddles. In a matter of minutes you can install a Dresser Service Saddle on steel or cast-iron pipe. The gasket of Dresser Grade 27 compound is already cemented firmly in place to make installation still easier. Saddles have exclusive plastic coating which won't "plate-out," has dielectric strength. Saddles are available in a complete range of sizes to give a "tailor-made" fit on any line from 1¼″ OD to 15″ OD. The original cost is low, and Dresser's high standards of strength and quality insure lasting performance.

FOR FURTHER INFORMATION write for your free copy of the illustrated folder *Dresser Service Saddles, Style 91.*

DRESSER®

ONE OF THE DRESSER INDUSTRIES

Dresser Manufacturing Division, 59 Fisher Ave., Bradford, Pa. Warehouses: 1121 Rothwell St., Houston; 101 S. Airport Blvd., S. San Francisco. Sales Offices in: New York, Philadelphia, Chicago, Atlanta, Denver. In Canada: Toronto and Calgary.

Digging range: Depth to 5'6". Width 19½" to 30".

a new advance for heavy-duty digging . . .

Barber-Greene Wheel Ditcher

This new development is Barber-Greene's latest addition to the four outstanding ditchers in the field.

Pace-setting features include:

New digging-wheel differential and split #1 shaft assure constant gear tooth contact on both sides of wheel . . . equalize torque . . . eliminate uneven stresses.

New flexible connection between chassis and boom eliminates excessive strain, twist and tilt on curves.

New Hydra-Crowd assures optimum digging speeds through independent, finger-tip control of crowding speeds—infinitely variable without shifting gears.

New electric overload release — provides overload protection without adjustment.

New all-hydraulic spoil conveyor— instantly reversible — operates independently of wheel. Infinitely variable speed to 650 f.p.m. permits accurate placement of spoil alongside ditcher.

New hydraulic controls — including hydraulic brakes — make operation easier, more accurate.

Advance models of this new Barber-Greene ditcher have already established a reputation for superior performance under the most grueling conditions.

Write for information on this newest ditcher in the Barber-Greene line of advanced design.

57-1-D

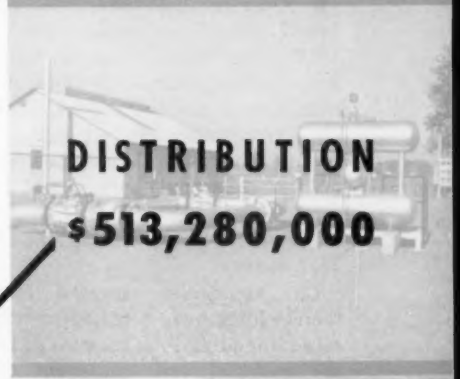
Barber-Greene BG

AURORA, ILLINOIS, U.S.A.

CONVEYORS . . . LOADERS . . . DITCHERS . . . ASPHALT PAVING EQUIPMENT

GAS 10th Annual Construction Survey

Construction budgets top $2 billion for first time



GAS market study

Record sums will be spent to meet demands for more gas

THE gas industry of North America has budgeted $2,170,671,000 for construction in 1957. The record-breaking figure was compiled from GAS' Tenth Annual Survey of Construction Budgets. Over 200 gas companies—representing more than 80 per cent of the connected meters and at least 95 per cent of the pipeline miles—actively participated in the 1957 survey.

Gas companies emerged from their winter budget meetings with this astounding total earmarked for the material and equipment required to construct new and replacement facilities. In addition, some of this $2 billion will go into new administrative buildings, and storage and production of gas.

Prime factors urging this spectacular expenditure are customers waiting in line for gas space-heating in many section of the nation and the one million new gas customers AGA estimates will be connected this year. Studies show that about one million new customers per year will be connected for the next 10 years. So, while the gas industry is at its peak of over 30 million connected customers, this peak will be but a short-lived step up to new levels. Similarly, we can expect the $2 billion construction budget mark to be a precarious record.

The high cost of construction under the current economy is reflected in the total budgeted. But, the importance of this factor is properly reduced when actual miles of pipeline and distribution main are considered. Total new pipeline miles to be constructed in 1957 are 10,040 as compared with 8451 in 1956. A comparison of new distribution main reveals 9102 miles for '57 as against 7819 miles in '56.

The budgeted expenditures to up-grade transmission and distribution operations can be added to those for physical extension of systems. The tendency is to replace manual operations with remotely or automatically controlled operations. Actually, the gas industry has entered the first phase of its "automatic age." It will continue to invest in the systems and equipment to further develop automation in gas operations.

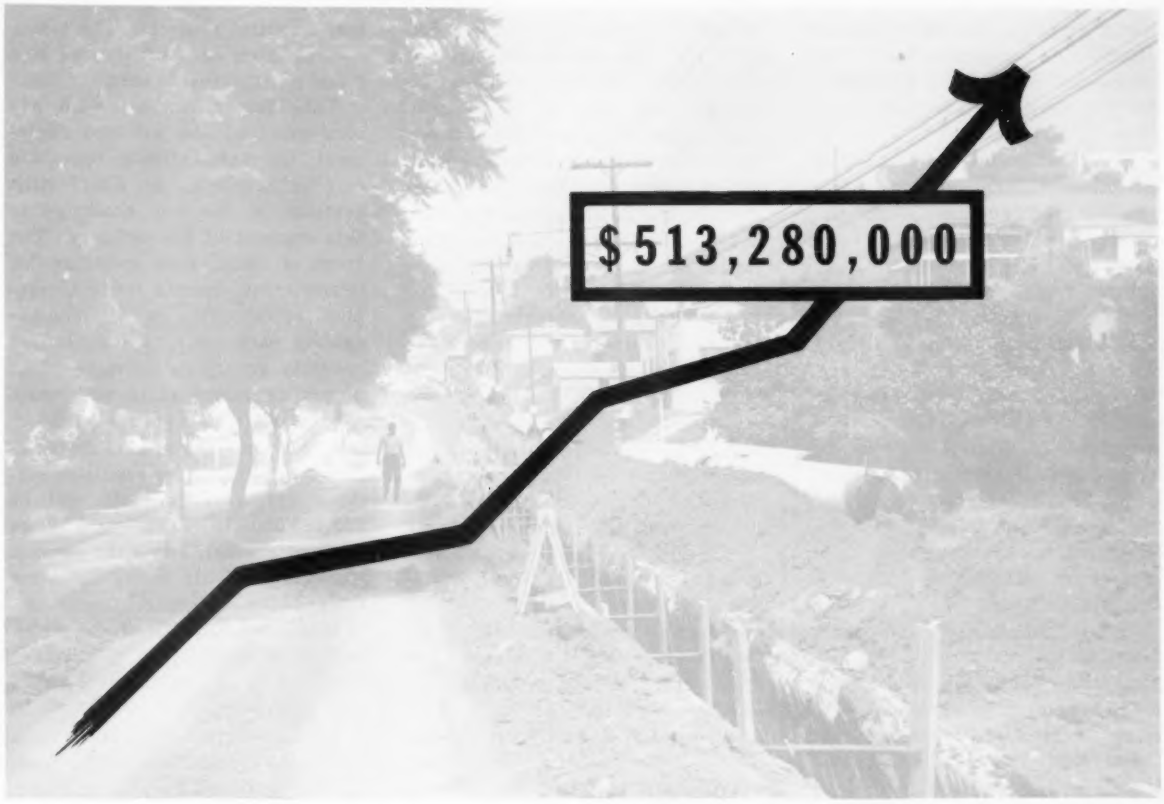
Here's how the money will be spent

Thousands of Dollars

	1956	1957
PRODUCTION	**$ 68,230**	**$ 103,461**
Plant facilities	36,086	47,181
Drilling	27,560	37,529
Not segregated	4,303	18,751
STORAGE	**26,974**	**43,923**
Holders	736	535
Underground	18,694	40,465
Underground pipe	3,732	1,281
Miscellaneous	1,794	943
Not segregated	2,018	699
TRANSMISSION	**836,321**	**1,160,497**
New line (Miles of line 8451.4—10,040)	265,535	842,173
Line replacement	15,055	40,173
Compressor stations	49,255	119,572
Autos and trucks	2,482	2,737
Construction equipment	404	1,041
Miscellaneous	5,036	40,102
Not segregated	489,554	69,699

Thousands of Dollars

	1956	1957
DISTRIBUTION	**$399,315**	**$ 513,280**
New mains (Miles of mains 7819.9—9,102)	177,688	205,717
Mains replacement	40,469	74,810
Meters, new services	126,115	155,261
Regulator stations	8,873	23,785
Cathodic protection	1,960	2,136
Autos and trucks	10,903	10,929
Construction equipment	3,816	4,979
Other	2,922	9,012
Not segregated	20,649	26,651
GENERAL	**56,823**	**57,130**
Administrative	8,890	5,652
Office systems	3,537	4,823
Administration building	19,171	17,285
Shop and laboratories	6,850	6,008
Communications	2,921	2,713
Other	9,855	14,477
Not segregated	5,599	6,172
TOTALS	**$1,387,663**	**$2,170,671**



Distribution companies increase 1957 budgets 28% over 1956

WHILE industry in general is tending to "plateau-out" in 1957, the distribution segment of the gas industry plans construction in excess of any previous year. A record-breaking $513 million has been budgeted to maintain, reinforce, and expand distribution systems. This 1957 figure exceeds that for 1956 by 28 per cent.

Key to the smashing total construction expenditures for 1957 revealed in GAS' Tenth Annual Construction Survey is the *295 million new gas appliances* that AGA estimates will be sold between 1957 and 1975, inclusive. This figure means large load increases each year for gas utilities although, of course, some of the appliance units will be for replacement. Distribution companies cannot wait for these loads to be connected before starting system expansion and extension. Thus, distribution system construction money for 1957 topped that for 1956 as gas utilities prepare for new customers and new appliances that will be added loads in '58, '59, and '60, in addition to the more immediate new loads of the current year.

GAS predicts this trend will continue. Distribution company construction budgets will continue to exceed the previous year by 15 to 25 per cent in both 1958 and 1959. Then, in 1960, our analysis of the past nine Annual Construction Surveys and future trends indicates that we can expect a spectacular *distribution construction boom.*

This accelerated construction phase will be brought on by advancement in the domestic gas-fired appliances and connection of new consumers. Built-in gas appliances will be a routine, rather than an unusual, feature. The prospects for a gas-fired heat pump are good during these years. Gas powered summer-winter air conditioners will be very familiar, if not common, appliances. And new color and design will spark sales appeal along with technical improvement of all gas appliances.

The $513 million budgeted for distribution construction in 1957 represents planned expenditures for

North America. However, Canadian distribution companies have firmly committed only about $35 million for the year. So, the bulk represents U. S. firms.

Many Canadian companies reported additional millions representing construction work they "might" or "hope" to get started or completed in '57. These were omitted from the survey in the interest of accuracy.

By comparing the budgets of 100 selected "pure" distribution companies that replied to both the 1956 and 1957 construction surveys, it was revealed that their construction budgets increased 11 per cent in 1957. Ten selected major integrated gas companies that replied both years reported budget increases for distribution work of 41 per cent for 1957. Thus, the major integrated companies—those with distribution, transmission, and in some cases production operations—plan to spend more on their already large distribution properties than the straight gas distribution utilities.

All of the 10 selected major integrated companies showed planned increases in their budgets for distribution system construction. Exactly 60 of the 100 selected straight distribution utilities showed increases for 1957, while 40 companies plan to reduce expenditures. The effect of the tight money market is reflected in these data. Obviously, the larger companies with a diversification of operations find less difficulty in financing. A commanding majority of the 40 of the selected distribution companies that reduced construction money for 1957 did so by amounts that were next to negligible. While, on the other hand, the companies reporting increases did so to the extent that resulted in the total 11 per cent increase for the selected 100.

The largest distribution expenditure will be for 9102 miles of new mains. This basic distribution construction function shows an increase of 16 per cent in 1957. But, the other basic operation—main replacement—shows an increase in 1957 of about 85 per cent.

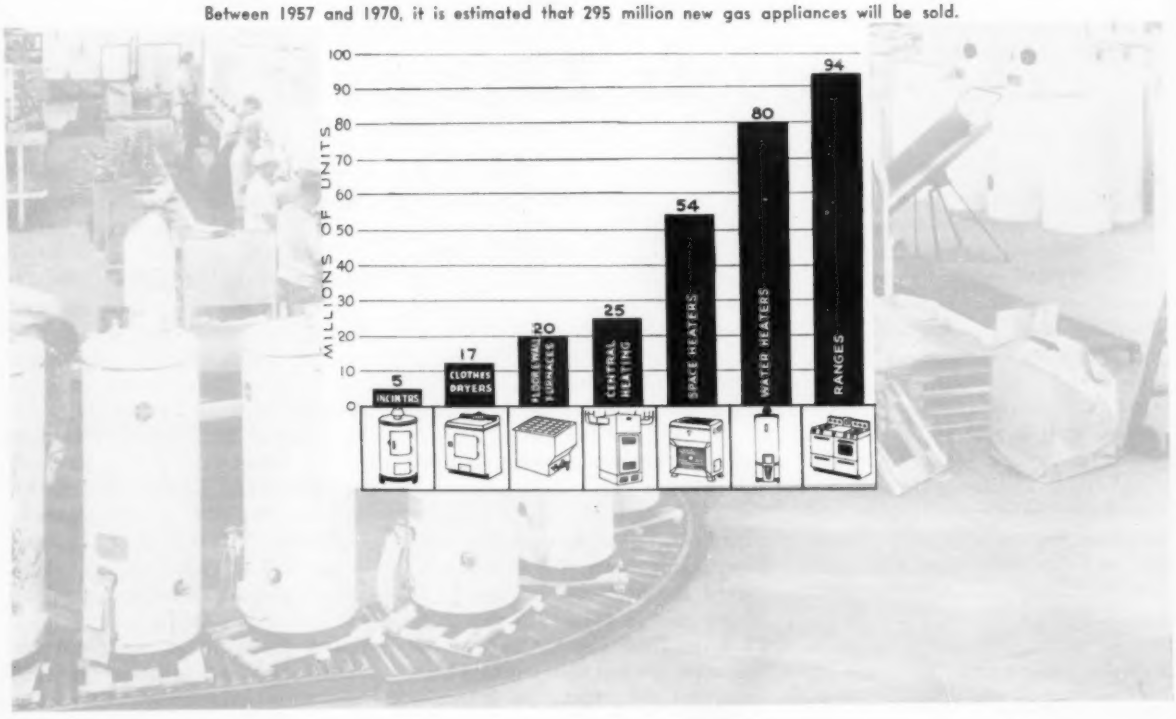
Automation is making itself felt in distribution construction. Many companies reported parts of construction budgets were going toward initiating or enlarging telemetering, remote control, and automatic control projects. The rising cost of labor has been urging this trend during recent years.

This factor coupled with advancement of the art and equipment for automatically operating certain functions in distribution systems is the new challenge to this segment of the industry. The trend of distribution spending for telemetering, remote control, communications, etc., will increase rapidly each year as distribution property operators strive to offset higher operating costs with more efficient methods and equipment.

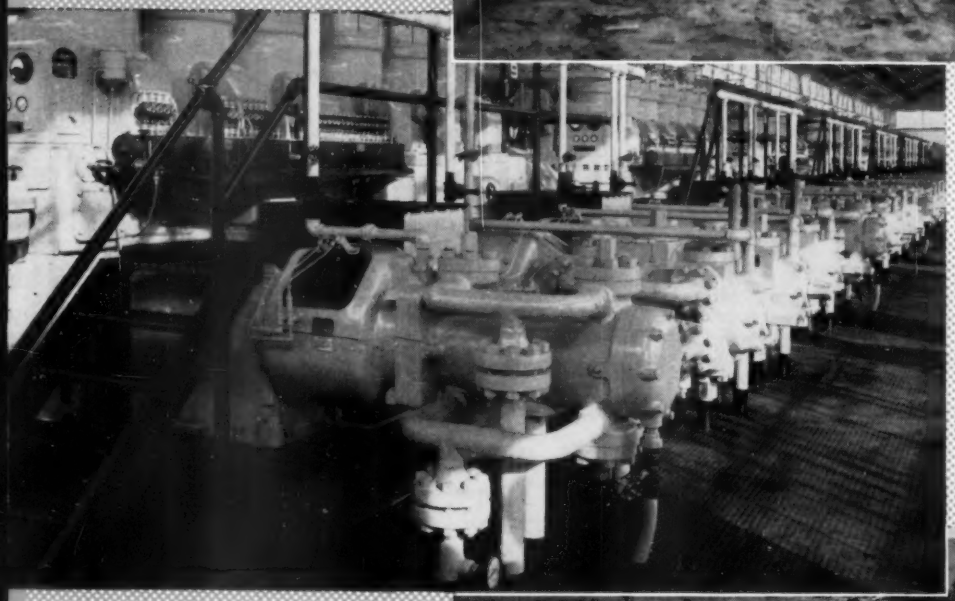
As an illustration, total distribution expenditures for regulator stations (pressure control) will be $23,785,000 in 1957, more than two and one-half times the amount spent in 1956. It shows the move toward better control, more dependable and versatile pressure control in direct relation to advancement of distribution technology and equipment.

So, distribution expenditures for 1957 add up to another record-shattering year. The growth of this part of the industry is the foundation for the growth of all other segments.

Between 1957 and 1970, it is estimated that 295 million new gas appliances will be sold.

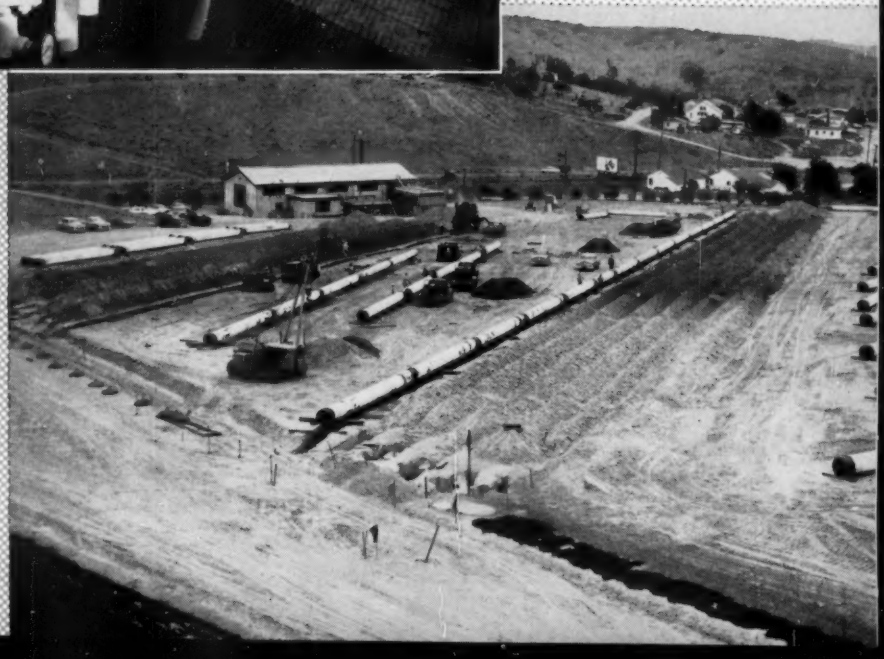


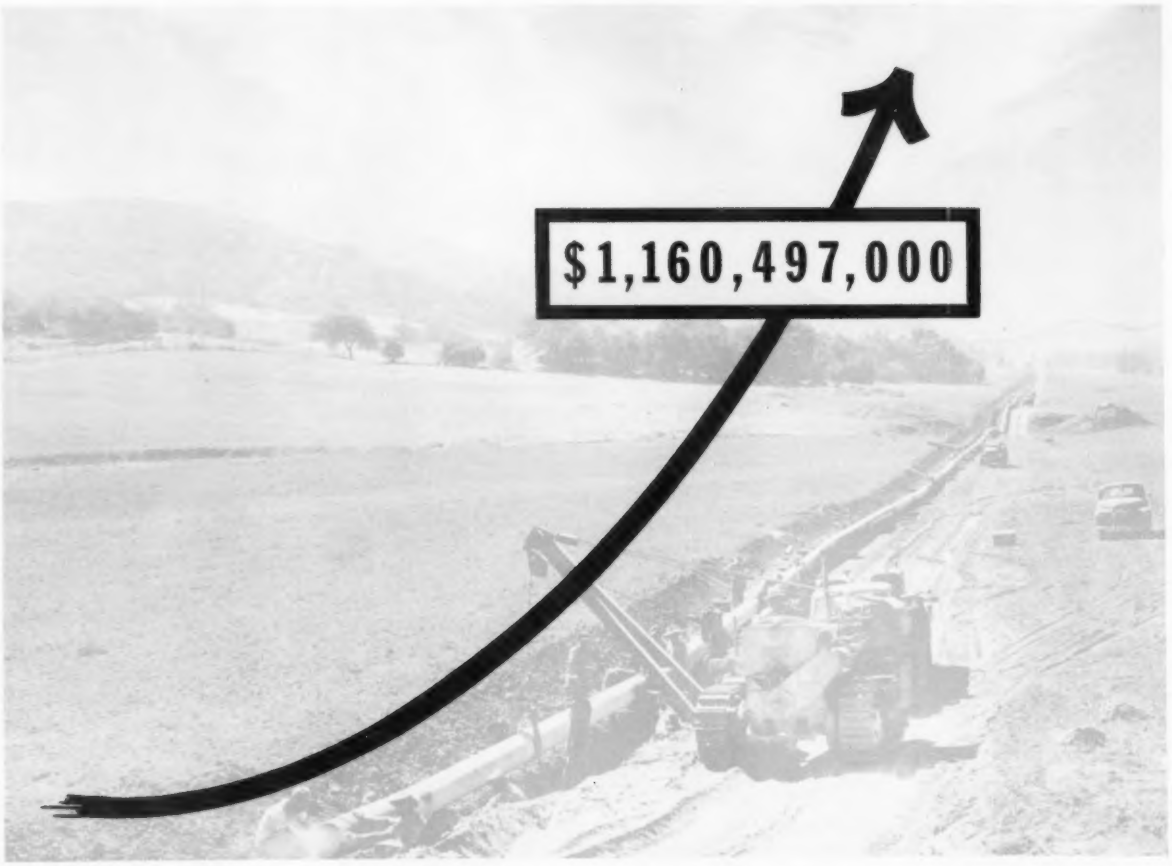
Distribution companies have increased their 1957 construction budgets 28 per cent over 1956, the previous high year. This year $513,280,000 will be spent to build new systems and expand existing ones.



Transmission companies will spend more money and build more miles of pipeline in 1957 than ever before. The record $1,160,497,000 budgeted for transmission companies in 1957 is 18 per cent more than 1956. More than $800 million will go for building new pipelines.

Storage is becoming more and more important to gas company operations. During 1957, the gas industry has budgeted $43.9 million for construction and development of all types of storage facilities. This represents a 56 per cent increase over 1956.





Pipeline companies plan to build 10,040 miles of new line in' 57

CONSTRUCTION of transmission facilities will reach its highest level in 1957. Distribution, integrated and straight transmission companies reported to GAS that they plan to spend $1,160,497,000 on transmission projects. Pipelines will be abuilding all over the North American continent during '57.

Actual miles of new pipeline to be constructed in 1957 are up more than 18 per cent over 1956 for a total of 10,040 miles. The cost will be $842,173,000 for the new pipeline miles. This is an increase of 38 per cent over 1956.

The 10,000 miles of natural gas transmission lines for 1957 can be compared with the 3000 miles of crude oil pipelines and the 3500 miles of petroleum products pipelines that will be constructed in the same year.

GAS market study

Key to transmission system expansion is the availability of line pipe. The market is still tight, but has eased markedly from its 1956 position. Most companies reported enough pipe committed for the year's projects and many were optimistic about getting more if they need it.

Some qualification of the transmission total is warranted. There may well be carry-overs into 1958, and some projects may not get started this year. The Midwestern Gas Transmission Co. plans are locked in FPC hearings at the present time. Unless there is a quick compromise among the parties involved, one guess is as good as another in predicting if this project will get started in 1957 and, if so, how much progress it will make.

Of unusual interest this year are pipeline construction projects that will import natural gas into the United States from two nations—Canada and Mexico. The first phase of Westcoast Transmission Co. Ltd.'s construction will be completed during 1957 and Canadian gas will be delivered to Pacific Northwest's *Scenic Inch*. At the same time, Texas Eastern Transmission Corp. is building away on its 395-mile line that will take Mexican natural gas at the Texas-Mexico border and move it to tie-in with its system at Vidor, near Beaumont, Texas. Thus, natural gas frontiers in both Canada and Mexico are being opened for the first time in 1957.

Further international gas industry interest centers on the Trans-

Canada Pipe Lines Ltd. project. This company reported that it expects to get 785 miles, costing $95 million, into the ground during the year. And, the Crown Corp. that will construct the Ontario Bridge portion of the Trans-Canada route estimates it will complete 310 miles ($50 million) of its 675-mile objective during '57.

The way has been cleared for the pipeline that will open the main body of the state of Florida to natural gas service. Coastal Transmission and Houston Texas Gas & Oil Corp. will jointly build the more than 1600-mile project. Construction should start immediately. There may well be some carry-over in these plans.

Tennessee Gas Transmission Co. has proposals to build a 557-mile pipeline from its recently completed Muskrat project in the Mississippi River Delta area up to its mainline system at Portland, Tenn. Then, TGT plans a 120-mile offshore line; a 76-mile line from Coudersport, Pa., to Hamburg, N. Y.; and 332 miles of looping in Kentucky, West Virginia and Pennsylvania. About 117,000 compressor horsepower will be added if FPC approves these plans. Another 42,140 hp and 100 miles of gathering lines will be constructed if the Midwestern plans are approved.

Transcontinental Gas Pipe Line Corp. plans 292 miles of loop lines in Louisiana, Mississippi, Alabama, Georgia, South and North Carolina, Virginia, Pennsylvania and New York at a cost of $59 million. Seven new compressor stations will be added to the system.

El Paso Natural has plans for over 700 miles of gathering and mainline for the year to boost deliveries to California. Southern California and Southern Counties Gas companies are constructing 241 miles of 30-in. line from Los Angeles to the California-Arizona border to pick up increased deliveries from El Paso. Cost of the project is about $21.3 million and will be shared.

Pacific Gas & Electric's 138 miles of 34-in. Topock-Milpitas line also ties-in with El Paso's construction to step-up California deliveries. Also, PG&E has 152 miles of varying diameter lines to be constructed during balance of this year.

Pacific Northwest Pipeline Corp. reports that 1957 construction will add 70.5 miles ($2.2 million) of mainline to its system completed in 1956. PNW has also budgeted $13.9 million for gathering system additions in 1957 and has several other projects planned.

Following FPC certification, Natural Gas Pipe Line Co. of America budgeted $26 million for 1957 construction of 350 miles of 20- and 26-in. line to bring long shut-in natural gas from Jack and Wise counties in Texas over to its mainline at Fritch, Texas. Texas Illinois will build 47.5 miles of pipeline in Illinois at a cost of $5.3 million. NGPL could possibly break loose on its planned 389-mile, 36-in. loop of its mainline from Beatrice to Chicago, but any prediction that it will start this year would be pretty wild.

East, west, north and south, wherever you might go on your vacation this summer, you might see a pipeline construction spread at work. They'll be making pipeline in Canada and on the Mexican border. In the Midwest and along the West and East coasts. They will be building transmission lines, compressor stations, and auxiliary equipment with a dollar-value that is 38 per cent higher than last year. Over $50 million will go into replacing lines. And $139 million plus has been allocated for compressor station construction.

Yes, 1957 is a big year for pipeline construction—the biggest year ever. It fits the gas industry's big picture. With distribution companies planning for additional customers as their systems expand and extend, the transmission end of the business meets this challenge through record construction.

1957 budgets of 170 gas companies . . .

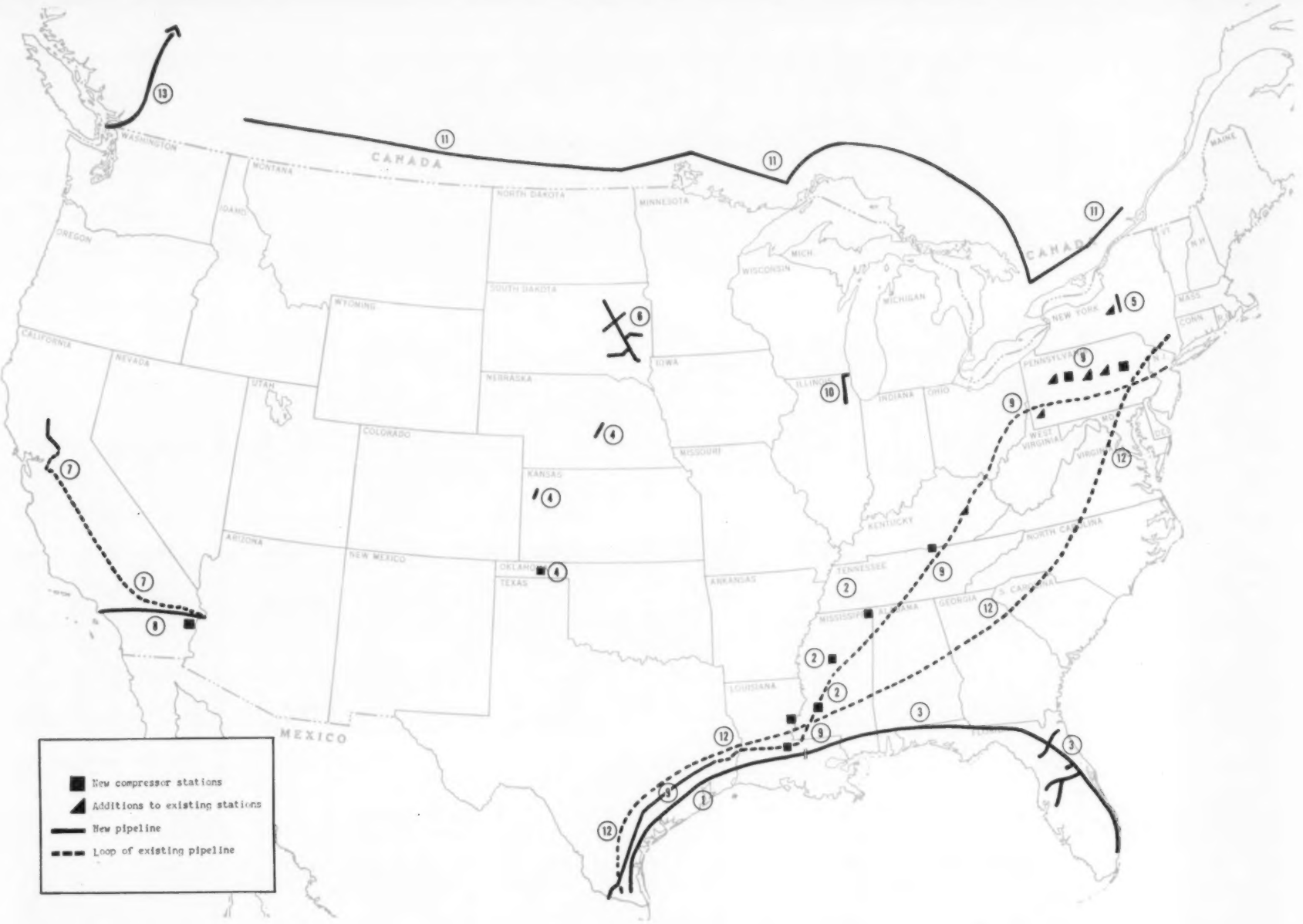
COMPANY	TOTAL (In thousands of dollars)	DISTRIBUTION (In thousands of dollars)								PRODUCTION (In thousands of dollars)	
		New Mains (Miles)	New Mains Cost	Replacement of Mains	Meter and New Services	Regulator Stations	Cath. Prot.	Autos and Trucks	Const. Equip.	Other	Plant	Drilling
Algonquin Gas Trans. Co., Boston	$ 300											
Arizona Public Service Co., Phoenix	4103	21.5	1688	80	1702	40	24	81	25	126		
Arkansas-Louisiana Gas Co., Shreveport	7500	←				2200				→	←	2000 →
Arkansas-Missouri Power Co., Blytheville, Ark.	685	←				283				→		
Arkansas-Western Gas Co., Fayetteville, Ark.	788	←				177				→	103	335
Assoc. Natural Gas Co., Blytheville, Ark.	300	←				230				→		
Atlanta Gas Light Co., Atlanta	8800	40.0	3857	126	3255			170	87		1212	
Baltimore Gas & Electric Co., Baltimore	7800	12.5	←			7600				→	←	200 →
Battle Creek Gas Co.	460	10	100		100	50	5	5			←	200 →
Berkshire Gas Co., Pittsfield, Mass.	450		139	73	120	29		22	5		14	
Boston Gas Co.	3350		820	780	770	18		250	60		180	
Bridgeport Gas Co., Bridgeport, Conn.	998	12	376	22	344	16	1	33	8		165	
Brooklyn Borough Gas Co., Brooklyn, N. Y.	337	1.5	52	11	220			20	16		2	
Brooklyn Union Gas Co., Brooklyn, N. Y.	9716	27	6000	120	2131	630	10	153	40		312	
Cabot, Godfrey L., Inc.	2122	←				200				→	←	480 →
California-Pacific Utilities Co., San Francisco	439		341		66			8	6		11	
Cambridge Gas Co., Cambridge, Mass.	425		115		60				4		240	
Canadian Western Natural Gas, Calgary	2985	30	515	143	684	121		136	117		43	
Carnegie Natural Gas Co., Pittsburgh	1376			2	1			3			182	575
Cascade Natural Gas Corp.	1350	←				1350				→		
Central Electric & Gas Co., Lincoln, Nebr.	1568	60	613	192	433	10	15	102	18		135	
Central Hudson Gas & Electric Co., Poughkeepsie, N. Y.	3609	6.5	224	135	418	35	20				67	
Central Illinois Light Co., Peoria	4895	134	2265	448	1490	35	6	55			568	
Central Illinois Public Service Co., Springfield	1630	22	226	245	153		6	15	22		300	
Central Indiana Gas Co., Muncie	1784		323	403	479	111	12	52	47		10	
Central West Utility Co., Kansas City	291	17	148	88	39	4	2	8				
Chattanooga Gas Co., Tennessee	501		218	13	132	18	9	39	17		52	
Chicago District Pipeline Co.	4600											
Cincinnati Gas & Electric Co., Ohio	3397	75	1100	631	800	150		86	37	65	49	
Cities Service Gas Co., Oklahoma City	12,904				15	177					3469	240
Citizens Gas & Coke Utility, Indianapolis	5247	120	2469		882	102		150	130		←	277 →
Citizens Utilities Co., Stamford, Conn.	398		330	46	2		4	9	1		6	
City Public Service Board, San Antonio	3499		1033	1000	765	55	190	65	124	193		
Colorado Interstate Gas Co., Colorado Springs	12,786				111						5640	2144
Colorado Springs, City of	600	←				300				→		
Columbia Gas System, New York City	102,167			14,346	3863	9305					4636	7562
Connecticut Gas Co., Berlin, Conn.	389											
Connecticut Light & Power Co., Berlin	1923		725	382	294	60		34			69	
Consolidated Edison Co. of N. Y., New York City	7900	←				7200				→	80	
Consolidated Gas Utilities Corp.	1637		324	174	316	25	179	30	10		230	
Consumers Power Co., Jackson, Mich.	17,987			12,627	3542	318					←	1500 →
Corpus Christi, City of, Texas	343		124	125	60	33			1			
Coastal Transmission Corp., Houston	68,000											
Dayton Power & Light Co., Ohio	3820	12.5	2680	129	855	70		70	16			
Delaware Power & Light Co., Wilmington	1865		401	180	510	30		17	27		←	40 →
Dominion Natural Gas Co., Buffalo, N. Y.	2500	←				2500				→		
East Ohio Gas Co., Cleveland	32,000		5890	2900	2370	495		592		1015	462	600
East Tennessee Natural Gas Co., Knoxville	1600											
*Empire Southern Gas Co., Fort Worth	485		100		30	10		27	4			175
*El Paso Natural Gas Co.	100,000											
Florida Power & Lite Co., Miami	260	←				260				→		
Gas Light Co., Columbus, Ga.	643		409	10	80	2	1	8	5			
Gas Service, Inc., Kansas City, Mo.	5912		35		10							
Greenwich Gas Co., Conn.	300	10	122	60	70			13	4		19	
Gulf Interstate Gas Co.	33,500											
Harrison Gas Division, UGI, Harrisburg	1342		531	200	348	28		60	46		81	
Hartford Gas Co.	795	12	430	31	224	16	2	44	34		17	
Haverhill Gas Co., Mass.	360		149	40	65	8		15	5		3	
Houston, Texas Gas & Oil	94,285											
Illinois Power Co., Decatur	7000	110	2365	500	900	60	60	90	100		700	
Indiana Gas & Water Co., Indianapolis	2015	57.8	701	199	574	20		85	56			10,000
Inland Natural Gas Co.	25,000											
Intermountain Gas Co., Boise, Iowa	2300		1340		840	20		30	20			
Iowa Electric Light & Power Co., Cedar Rapids	1837	32	329	331	471	18	4	35		633		
Iowa-Illinois Gas & Electric Co., Davenport	2835	78	743	447	1115	120	27	20	38			
Iowa Power & Light Co., Des Moines	1603		652	61	736	36	11	80	17		←	30 →
Iowa Public Service Co., Sioux City	1132		447		463	53		42	13		81	
Kansas-Nebraska Natural Gas Co., Hastings	6576	35	130	150	390	15	20	30	10		1883	1820
Kentucky-West Virginia Gas Co.	2866										875	1889
Lake Shore Gas Co., Ashtabula, Ohio	531		235	46	148	17		24			3	
Lancaster County Gas Division, UGI, Penna.	788	15	400	113	197	13		32	6		6	
Las Cruces Municipal System, New Mexico	457	←				457				→		
Lehigh Valley Gas Division, UGI, Allentown	1863	21.3	642	260	278	40		51	54	42	42	
Lone Star Gas Co., Dallas	31,952		4441	1852	2695	105	5	458	201	200	←	13303 →
Long Island Lighting Co., Mineola, N. Y.	11,440	173.5	7000	800	2400	100	40			160	30	
Louisville Gas & Electric Co., Kentucky	2710	75	1100	200	700	97		15	30			
Louisiana Power & Light Co., New Orleans	1816	135	918	200	532	100	22	18	5			
Madison Gas & Electric Co., Wisconsin	1185	25	721	95	242	63		8	5		27	
Memphis Light, Gas & Water Co., Tenn.	3468	206	2193	336	313	230	15	52	20			
Metropolitan Utility District, Omaha	2461	56	833		675	112		120	66		19	
Michigan Consolidated Gas Co., Detroit	30,899	396	13,129	3640	8854	900	2	882	440			
Michigan Gas Storage Co., Jackson	3151											
Michigan-Wisconsin Pipe Line Co., Detroit	6760											
Midsouth Gas Company, Little Rock	558	25.4	152	66	143	10	35	38	11			
Midwestern Gas Transmission, Houston	103,000											
Minneapolis Gas Co., Minnesota	6600	82	1850	870	2640	50		315	175		385	
Mississippi Valley Gas Co., Jackson	1917		798	150	665	20	59	86	22		1	

GENERAL (In thousands of dollars)						TRANSMISSION (In thousands of dollars)							STORAGE (In thousands of dollars)			
Adm.	Office System	Bldg.	Shop and Lab.	Communications	Other	New Lines (Miles)	New Lines Cost	Replacement of Lines	Comp. Stations	Autos and Trucks	Const. Equip.	Misc.	Holder	Underground	Pipe	Misc.
166	16	22	78	55				60		50	75	115				
←		300			→				3000			→				
←		34			→	18.5	313					55				
←		48			→	←			127			→				
←		28			→	←			42			→				
	43			12	38											
	10		8		30											
	21		28		23	5.5	400									
	32			1												
	13		3													
←		320			→									1402		
					40											
2		4	1													
	2	4														
	36	800	35	23		4.5	106	226								
	8		10	8	8			480	20	30	37	12				
	40		3	7												
						50	2575	120	22							
			4		24	6.5	79	578				6				
	12	259	3	7										46	20	
	7	3	2	2												
						14	4600									
	2					2.9	295	369				13				
	16		60	75	182			5678	907		45	103		1937		
	25	950							262							
	44		24	6												
	183	166		949		734		176	1591	621	118	1087				
←		3108		→	8961	8	←		300			→				
								23.356	7969			1831		17.230		
							373	16					379			
←		600			→								←	20	→	
	50							194	10	45	25	25				
							68.000									
						10.5	660									
	90	8	227	48		119.25	13.743	758	213			174		2127	288	
						21	480	50	1000	15		75				
						10	139									
						600										
	7	118	1		2											
	5															
	12															
									33.500							
	29	5	8	3									3			
	17	4			6											
	5		8		62											
						1600	94.285									
			800			50	975	250	100					100		
	31	42			12			209	18				2	66		
	18	5	12	15		329	15.000									
			16													
25	27	63		10												
	5	10			18											
	15	40		105	5	44	487	665	816	40	25	20				
	13	1	21	7	27			15	17			1				
	11	30	2	2	13											
	5			5	11											
	29	425														
	218	1735		37	461	58.7	1542	1464	280	359	87	1880		629		
	200	500			200								10			
						10.3	468	10		10				80		
	1		15	5												
	4															
37	44		208	20												
800	180		636	124										1687		
	261															
	2			5	75							29		3040		
	2		1			121	6400	160		140		60				
							100									
						2067	103.000									
←		315			→											
	20	72	7	1				15						1		

1957 budgets of 170 gas companies . . .

COMPANY (In thousands of dollars)	TOTAL	DISTRIBUTION (In thousands of dollars)									PRODUCTION (In thousands of dollars)	
		New Mains (Miles)	New Mains Cost	Replacement of Mains	Meter and New Services	Regulator Stations	Cath. Prot.	Autos and Trucks	Const. Equip.	Other	Plant	Drilling
Missouri Natural Gas Co., Farmington, Mo.	1051	23	420	80	200	4	20	15	5	41		
Mobile Gas Service, Ala.	998	45	498	18	400	52			20			
Montana-Dakota Utilities Co., Minneapolis	3100	50	500	297	575	60	8				100	
Nashville Gas Co., Tennessee	841		420	20	350	10		25	9			
Natural Gas Pipeline Co. of America, Chicago	41,023				23	161			8		4822	152
Natural Gas Storage Co. of Illinois, Chicago	4815											
Natural Gas System Co., Coolidge, Ariz.	207	21	93	31	57			12	8			
New Bedford Gas & Edison Co., Mass.	648	1.8	120	30	99				8		384	
New Haven Gas Co., Conn.	628		268	10	224	28		40	51		4	
New Jersey Natural Gas Co., Asbury Park	2900		1167	300	1115	20		150	20		20	
New Orleans Public Service Co., Louisiana	2388	38.2	414	479	494	30		70	44			
New York State Electric & Gas Corp., Ithaca	6377	125	3125	1266	1059	75					1	
New York State Natural Gas Corp., Philadelphia	12,489										970	3940
Northern Illinois Gas Co., Aurora	20,900	500	9040		5730			750				
Northern Oklahoma Gas Co., Ponca City	420	3	30		10	5		5			50	100
Northern States Power Co., Eau Claire, Wis.	3393	99	2756	35	427	166			5		←	4 →
Northern States Power Co., Minneapolis	9818	191	6172	124	1619	266			31		1606	
Northland Utilities, Limited, Edmonton	750	30	300		150	40		10	12			
North Penn Gas Co., Port Allegheny, Pa.	500	10	50	33	50	7		40			5	
North Shore Gas Co., Waukegan, Ill.	1583	33.2	444	199	634	53	4	63	43	23	74	
Northwestern Public Service Co., Huron, S. D.	1384	65.5	619	257	305	70	20	12	59		←	9 →
Norwich, Department of Public Utilities, Conn.	36	3	10	15	5							
*1Northern Natural, Omaha	63,000											
*2Niagara-Mowhawk Power Corp., Syracuse	11,798	210	3791	1929	2391	594		165			204	
Oklahoma Natural Gas Co., Tulsa	9716	207	1221	1409	1054						658	1634
Pacific Gas & Elec. Co., San Francisco	47,000	600	9392	2062	9826	75	73		77	564	179	
Pacific Lighting Gas Supply Co., Los Angeles	5403											
Pacific Northwest Pipeline Corp., S. L. C.	31,733					478	442				219	8883
Pensacola, City of	401	50	208		170			8	6			
Peoples Gas Light & Coke Co., Chicago	14,400	41.8	2622	350	3540	160		397	284	350	2834	
Peoples Natural Gas Co., Pittsburgh	10,006		2209	450	985	262				110	1122	2192
Peoples Water & Gas Co., North Miami	693	20	203	38	323	9		34	21		47	
Petersburg & Hopewell Gas Co., Va.	375	41.5	221	5	103	24		4	4			
Philadelphia Elec. Co.	10,000	100	4585	710	1263	105	15				1806	
Philadelphia Gas Works Div., U. G. I.	10,399	51.4	3385	1347	2007	332		128	74	486	1787	
Providence Gas Co.	900	18	450		300			50			←	100 →
Public Service Co. of Colorado, Denver	7952	380	2430	778	3535	234	70	36				
Public Service Co. of N. C., Gastonia	900	30	250	75	250	25		25	25			
Public Service Elec. & Gas Co., Newark	28,000	200	12,700	800	6000	900		750	400	3000	3000	
Portland Gas & Coke Co., Oregon	6058	200	2489	971	1644	58	40	169	108		324	
Quebec Hydro Electric Commission, Montreal	1690	5	300	250	210	75	15	4		500	250	
Reading Gas Division, U. G. I.	583	8	170	30	248			38	12		35	
Richmond, City of	875	25	400		325							
Rochester Gas & Elec. Corp., N. Y.	5123	90	1917	510	2315	24			51		307	
Rockland Light & Power Co., Nyack, N. Y.	1373	45	750	10	478	11	4	100	16			
San Diego Gas & Elec. Co.	3832	110	1187	539	1413	6		104	62		5	
Saskatchewan Power Co.	5865		2500		2290	100	50	75			350	
Sierra Pacific Power Co., Reno, Nev.	275	.4	16	27	170			18	5		32	
South Carolina Elec. & Gas Co., Charleston	2138	150	1588	10	395	18	19	30	15		5	
Southeastern Michigan Gas Co.	489		51	35	219				5			
Southern California Gas Co., Los Angeles	44,000				18,000							
Southern Counties Gas Co.	23,526	1000	5970	2000	6500	20		422	91			
Southern Indiana Gas & Elec. Co., Evansville	1346	38	316	119	435	33	12					
Southern Union Gas Co.	10,561	223	2040	199	1575	35	187				1795	3111
South Jersey Gas Co., Atlantic City	1686	58.5	720	190	418	18	5	47	26		6	
Spokane Natural Gas Co., Washington	2151	55	794	100	1112	25		30	40			
Springfield, City Utilities Co., Missouri	695	21.5	393	20	210	3		14	24			
Tennessee Gas Transmission Co., Houston	184,800											
Texas Eastern Penn-Jersey Trans. Co.	7964											
Texas Eastern Transmission Corp., Shreveport	64,766											
Texas Illinois Natural Gas Pipeline, Cg.	6276				12	102						
Trans-Canada Pipe Lines, Toronto	98,000											
Transcontinental Gas Pipeline, Houston	113,000											
Tucson Gas Elec. Light & Power Co.	750	52	415	100	200	25		5	5			
Union Gas System, Inc., Independence, Kan.	939		298	124	30						24	119
Union Light, Heat & Power Co., Covington	695	35	300	175	129	40		7	29	15		
United Natural Gas Co., Oil City, Penna.	1905	←					694			→	←	410 →
*United Gas Improvement	5875											
Washington Gas Light Co., D. C.	12,400	204	4900	387	4421	342	260	327	137		5	
Washington Natural Gas Co.	4000	100	1625	290	1370	175	10	90	65		125	
Western Kentucky Gas Co., Owensboro	1880		923	98	426	2	6	51	45			
Wilcox Trend Gathering System, Shreveport	1247											
Wisconsin Michigan Power Co., Appleton, Wis.	425	6.8	195	6	207	3	3		2			
Wisconsin Natural Gas Co., Racine	3269	70	1910	652	525	100		75				
Wisconsin Power & Light Co., Madison	672		572	15	75	5	5					
Wisconsin Public Service Co., Milwaukee	2770		1115	425	400	135	50	60		170	20	
Wisconsin Southern Gas Co., Lake Geneva	659		271	70	67	11	2	12	20		31	
Worcester Gas Light Co., Mass.	2216	35	1005	135	390	17			23		518	
*West Coast Transmission Co., Vancouver	151,000											
Company "A"	1810	35	704	193	477	52		24	48	299		
Company "B"	9599	58	1320	1934	865						1019	2058
Company "C"	4783		1754	238	1292	344	15	210	222		←	156 →
Company "D"	4116	67	2100	100	300	100		75	75	1000		
Company "E"												

GENERAL (In thousands of dollars)						TRANSMISSION (In thousands of dollars)							STORAGE (In thousands of dollars)			
Adm.	Office System	Bldg.	Shop and Lab.	Communications	Other	New Lines (Miles)	New Lines Cost	Replacement of Lines	Comp. Stations	Autos and Trucks	Const. Equip.	Misc.	Holder	Underground	Pipe	Misc.
	10			2		6	254									
	10															
	42		15	18	80	27	865	124	380			36				
	7															
	112			58	226	350	26,001	474	8628	181	123	54		1712	779	
							1169		1089	33	28	5				
	2			2	2											
	2				5											
	3															
	30	10			60				5				3			
	13	816	26	2												
	2					11	243	606								
	15		13	20	41	55	4603	123	280			122		2362		
2200	75	2155	320		30								←	600		→
	8		1	1		10	180		10	5		15				
	2		6				230									
	16				42			180						77		
	23	6	7	3	7											
	6	10	7	10												
	5			1		←			63,000			→				
	45					65	←		2679			→				
479	278				661	35	825	760	66						76	595
			10		100	290	20,492	860	2703			258		319		
					40	14.6	584	60	190			76		4453		
308	70			147	870	70.5	2234		3056	323		14,703				
			8	1												
1378	263	1097	861	14	250											
	20			51	401		947	720	79			85		373		
	9	3	3	3												
	4	4	6													
←		975			→			300	200			41				
	728				27								98			
1	22	77	2	3		31	597		34	22		111				
10	10	10	10	10		8	200									
	110				340											
	30	81			109								35			
←		86			→											
	21		17	5	7											
		150														
			4													
60	38	291	6	23	28				65			12	←		3	→
←		150			→	25	350									
				7												
		28				←			30			→				
	5					8.3	174									
		5000				244	21,000									
	41	453				241	7113		916					185	15	
	7	34	19	2	36	7.5	126		7							116
	246	386	3	6	344	26	432	65	5			16				
	22	210		8	16											
	10	22	10	8												
			30	1												
	31		306	31		1185	184,600									
60	391	65	1253	558		900	230		7306	30	30			550		
						800	51,643		9211	652	375					
	8		10	25	59	47.5	5342	388	160	111	41	18				
						785	95,000					3000				
						292	59,000		38,000			16,000				
	10	18		7			162	63		38	13			28	5	
←		210			→	←			516			→	←		75	→
	107	583	6	15									5	830	95	
40	40	125	45													
	22	11		8		23.1	290									
	15		4	3		100	997		187	25	16					
	1		8													
	2		2	2	1											
			40			8	255		100							
	9	6	60		100											
64	8	35	15		6											
						200										
	3	7	3													
	31	8		103	362			537	130			9		1223		
																232
	33	254	25	8												
	5		350	11												


CANADA
CANADA
MEXICO
WASHINGTON
OREGON
CALIFORNIA
NEVADA
IDAHO
MONTANA
WYOMING
UTAH
ARIZONA
COLORADO
NEW MEXICO
NORTH DAKOTA
SOUTH DAKOTA
NEBRASKA
KANSAS
OKLAHOMA
TEXAS
MINNESOTA
IOWA
MISSOURI
ARKANSAS
LOUISIANA
WISCONSIN
ILLINOIS
MICH.
MICHIGAN
INDIANA
OHIO
KENTUCKY
TENNESSEE
MISSISSIPPI
ALABAMA
GEORGIA
FLORIDA
S. CAROLINA
NORTH CAROLINA
VIRGINIA
WEST VIRGINIA
PENNSYLVANIA
NEW YORK
MAINE
VT.
N.H.
MASS.
CONN.
New compressor stations
Additions to existing stations
New pipeline
Loop of existing pipeline

Major 1957 pipeline projects underway or authorized

1. *Coastal Transmission Corp., Houston, Texas.* Line from Rio Grande valley to Baton Rouge, La. to tie-in with Houston Texas Gas & Oil Corp.s Florida line. Cost: $60 million.

2. *Gulf Interstate Gas Co., Houston, Texas.* Addition of 2000-hp at Acadia, La. station; 3500-hp addition to Stanton, Ky. station; new 3500-hp stations at Rapides, La.; Humphrey and Alcorn, Miss., and Macon, Tenn. Total cost: $33.5 million.

3. *Houston Texas Gas & Oil Corp., Houston, Texas.* A 961-mile, 26-in. mainline from connection with Coastal Transmission Corp. line on east bank of Mississippi river near Baton Rouge, La., across Mississippi, Alabama and Florida to terminus in Dade county, Fla., near Miami. Also includes 496 miles of laterals and five compressor stations totaling 42,000 hp. Total cost: $110 million.

4. *Kansas-Nebraska Natural Gas Co., Hastings, Neb.* 20.8 miles of line in Nebraska (10.4 miles 10-in. and 10.4 miles 8-in., paralleling existing line). In Kansas, 11.5 miles of 12-in. line to replace existing 8-in. line. New compressor station, 1600-hp, at Baker, Okla. Estimated total cost: $900,000.

5. *New York State Natural Gas Corp., Pittsburgh, Pa.* Addition of 1100-hp to Ithaca (N.Y.) compressor station and construction of 15.3 miles of 30-in. loop from Horseheads, N. Y. to Newfield, N. Y. Total cost: $2.3 million.

6. *Northern Natural Gas Co., Omaha, Neb.* Total of 354 miles of line and 18,640 hp in compressor capacity (163 miles of line extension from Sioux Falls, S. D. to Aberdeen, S. D., plus 160 miles of branch lines in South Dakota).

7. *Pacific Gas & Electric Co., San Francisco, Calif.* Eighty-three miles of 20-, 18-, and 16-in. line from Beehive Bend field near Willows, Calif. to a point near Davis and then east into Sacramento. Also, 85 miles of 34-in. loop on Super Inch line from Topock, Ariz. to Milpitas, Calif.

8. *Southern California Gas Co. and Southern Counties Gas Co., Los Angeles.* Jointly building 241-mile, 30-in. line from Newhall, Calif. to Colorado river near Needles to connect with El Paso Natural Gas Co. line from San Juan and Permian basins. Four 2000-hp compressors will be installed at new station near Needles.

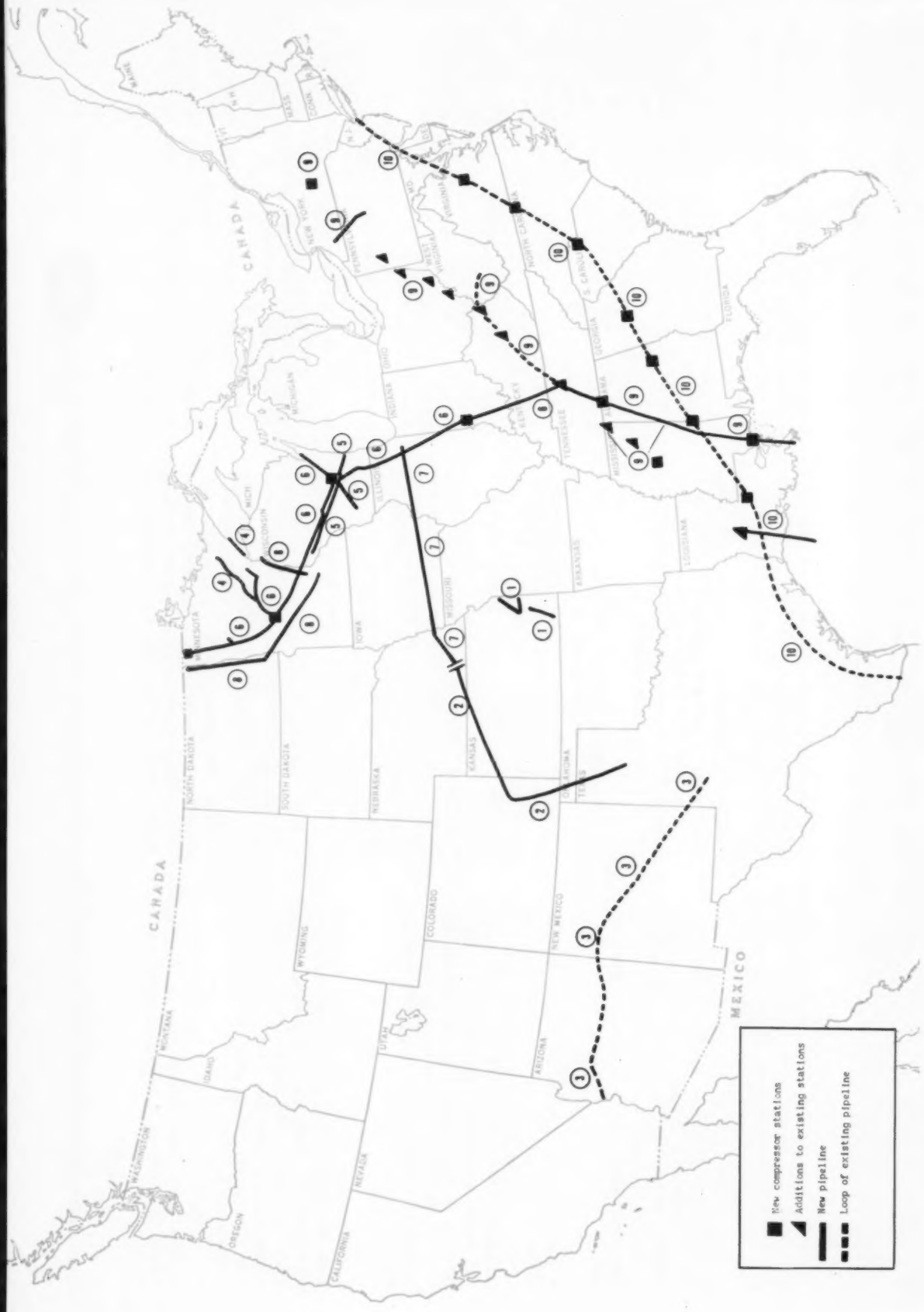
9. *Texas Eastern Transmission Corp., Shreveport, La.* Now building 422 miles of 30-in. line from a point at the Mexican border to transport gas to its existing Vidor, Texas station; 45 miles of 24-in. line connecting an existing line near Provident City, Texas to the new line; pipeline loops totaling 77 miles at various locations along existing 30-in. system; 147 miles of supply and sales laterals. New and additional compression facilities totaling 32,250 hp are being installed at various locations along the Texas Eastern route.

10. *Texas-Illinois Natural Gas Pipeline Co., Chicago.* Will construct 38 miles of 36-in. loop extending from the vicinity of Joliet, Ill. to its existing 20-in. line to connect with existing facilities of Chicago District Pipeline Co.

11. *Trans-Canada Pipe Lines Ltd.* Now building a 2287-mile line from the Alberta-Saskatchewan border to Toronto and Montreal, with lateral from Winnipeg to Emerson, Man. Line will be 34-in. from Alberta border to Winnipeg; 30-in. from Winnipeg to Toronto; 24- and 20-in. from Toronto to Montreal; 24-in. from Winnipeg to Emerson. Also to be built are 10 compressor stations totaling 105,000 hp. Cost of 1957 construction: $98 million.

12. *Transcontinental Gas Pipe Line Corp., Houston, Texas.* One hundred six miles of 36-in. parallel mainline and 68 miles of 30-in. parallel mainline through Louisiana, Mississippi, Alabama, Georgia, North and South Carolina, Virginia, Maryland and Pennsylvania.

13. *Westcoast Transmission Co. Ltd., Vancouver, B. C.* Now building a 650-mile, 30-in. line from Peace River area to a point near Vancouver, B. C. to connect with line of Pacific Northwest Pipeline Corp.


CANADA
MEXICO
New compressor stations
Additions to existing stations
New pipeline
Loop of existing pipeline

Major 1957 pipeline projects planned or proposed

1. *Cities Service Gas Co., Oklahoma City, Okla.* Proposes to build 74 miles of line from Independence, Kan. to Welda, Kan.; 22 miles of line from Ottawa, Kan. to Kansas City, Kan.; and 10 miles of line from Ottawa, Kan., to Paola, Kan. Total cost of proposed lines: $5.8 million.

2. *Colorado Interstate Gas Co., Colorado Springs, Colo.* Proposes to build facilities to increase its daily system delivery in the Rocky Mountain area to 650 MMcf, and provide 460 MMcf/day for sale to Natural Gas Pipe Line Co. of America at Beatrice, Neb. Major construction in this project will include: 215 miles of loops, ranging from 26-in. to 34-in. from Fourway compressor station in Texas to Kit Carson station, Colo.; 100 miles of 24-in. line between Springfield and Pueblo, Colo.; 345 miles of 30-in. line from Kit Carson, Colo. to Beatrice, Neb. to join the NGPL line. Also proposed are four new compressor stations totaling 32,000 hp, and additional compression at seven existing stations totaling 28,980 hp.

3. *El Paso Natural Gas Co., El Paso, Texas.* Proposes to build 888 miles of mainline loops and field lines and install 56,990 hp in compressor capacity in Texas, New Mexico and Arizona in order to deliver 70 MMcf/day additional to Southern California and Southern Counties Gas companies and 75 MMcf/day additional to Pacific Gas & Electric Co.

4. *Iron Range Natural Gas Co., St. Paul, Minn.* Proposes to build 68 miles of transmission line and 47 miles of supply laterals to various towns and cities on the Mesabi iron range in Minnesota.

5. *Michigan-Wisconsin Pipe Line Co., Detroit.* Proposes to build 424 miles of extensions, 48 miles of mainline loop, and install 12,600 hp of compressor capacity in Wisconsin, Illinois and Michigan to initiate gas service to 10 companies for distribution in 41 communities in Wisconsin and one in Michigan.

6. *Midwestern Gas Transmission Co., Houston, Texas.* Proposes to build a 1112-mile line from Portland, Tenn. (where it connects with the Tennessee Gas Transmission Co. line) to the U. S. border near Emerson, Manitoba. An additional 648 miles of mainline extensions would be built to serve cities in Minnesota, Wisconsin and eastern North Dakota. Five compressor stations are also planned. Estimated cost of project: $98 million.

7. *Natural Gas Pipe Line Co. of America, Chicago.* Proposes to build 416 miles of 36-in. loop line from Beatrice, Neb. to Joliet, Ill. Additional work will include supercharging 86 units at compressor stations 102-110, and installing two 3000-hp units at Beatrice.

8. *Northern Natural Gas Co., Omaha, Neb.* Proposes to build 400 miles of 24-in. line from the U. S.-Canada border to a point near Minneapolis, and install two compressor stations with 5280-hp each. Also proposed is a 168-mile, 20-in. line from the Twin Cities area to Superior and Duluth, Minn.

9. *Tennessee Gas Transmission Co., Houston, Texas.* Proposes to build 1085 miles of pipeline, and six new compressor stations, plus enlarge seven existing stations. Included in this proposal is a 557-mile line from the Mississippi river delta area south of New Orleans to Portland, Tenn.; a 120-mile line from Kinder, La. to offshore wells in Gulf of Mexico; a 76-mile line from Coudersport, Pa. to Hamburg, N. Y., and 332 miles of loop line in Kentucky, West Virginia, and Pennsylvania. Total horsepower of new compressor stations and enlargements is 117,240. TGT also proposes to add 42,140 hp by constructing five new compressor stations and enlarging four present stations in Texas and Louisiana. Also included in this proposal is the constructing of 100 miles of gathering lines in Texas and Louisiana. These facilities would supply gas to the proposed Midwestern Gas Transmission Co. line.

10. *Transcontinental Gas Pipe Line Corp., Houston, Texas.* Proposes to build seven new mainline compressor stations in Louisiana, Mississippi, Alabama, Georgia, North Carolina and Virginia, and install additional horsepower in nine existing stations. Also included is the construction of additional mainline loops.

GAS market study

Storage—$26.9 million

GAS companies have budgeted $43.9 million for development of storage and construction of required equipment in 1957. This compares with $26.9 million in 1956—an increase of 56 per cent.

The vast majority of this money will be spent on increasing natural gas storage underground in depleted gas or oil reservoirs. It follows that expenditures for aboveground holders will be reduced in 1957 and underground pipe-type holders also will decline.

The trend is toward terminal storage. This is particularly pronounced in the Midwest and East. However, there are sizable projects on the West coast and several in the Southwest. Pipeline companies are developing extensive storage projects to improve summer load-factors and provide "banks" of natural gas near load-delivery concentrations during winter months.

Storage represents the immediate answer to thousands of connected gas customers who are waiting for gas space-heating service in several sections of the country. Reservoirs are usually developed in an orderly manner after trial periods prove the practicality of underground reservoirs. Therefore, many gas companies reported their expenditures will be funneled into compressor facilities for injection and production, new dehydration plants with capacity to handle increased volumes as the reservoir is proved for efficient storage, new or additional metering and pressure control equipment, additions to storage field gathering systems, and new wells for injection and withdrawal.

LPG storage is beginning to loom large in storage budgets. It is difficult to classify as storage because many gas companies reported LPG projects as peak shaving plants, enrichment facilities, stand-by gas, etc. But, anyway you put it, the relatively large investment in such plants can be, and often is, used for augmenting winter send-out volumes.

The trend of increasing underground storage will continue as the economics improve. With the present gas price structure, more and more companies are either actively developing such projects or they are studying the matter seriously.

Production-$103 million

PRODUCTION expenditures gained 51 per cent in 1957. The total budgeted for 1957 is $103 million. Forty-five per cent will go for plant, 37 per cent for drilling wells, and 18 per cent was not segregated.

Drilling will be stepped up for the companies reporting in GAS survey. Only those integrated and transmission companies with drilling-producing affiliates are covered by the production section of the survey. It does not reflect drilling activity by major or independent oil companies and independent gas producers. But it shows that gas companies with natural gas drilling and producing operations have stepped up the pace in relation to the increasing demands by budgeting $37.5 million for drilling.

Colorado Interstate Gas Co. has a program for 29 development wells in 1957. This company will spend $5.64 million for new gathering facilities in its production areas. The Columbia Gas System has earmarked $7.56 million for drilling to add gas supplies in its vast pipeline and distribution system. And the Kansas-Nebraska Natural Gas Co. has an extensive drilling and production plant program for the year.

An integrated gas company in the Southwest will venture over $2.6 million for exploration and leasing while investing $8.7 million in a drilling program. New York State Natural Gas Corp. will drill 34 new gas wells at a cost of $3.9 million. The Peoples Natural Gas Co. has included 40 new shallow wells and 9.5 (net) new deep wells in its 1957 drilling program. Out West, Pacific Northwest Pipeline Corp. has allocated $8.8 million for 102 (net) wells.

Gas producing plant construction for 1957 is concentrated in LPG systems for peak shaving, demand rate shaving, stand-by, and enriching. The increase for 1957 over '56 is by 30 per cent.

Atlanta Gas Light Co. has an interesting LPG peak shaving plant designed to store the hydrocarbon in liquid state under refrigeration. It plans to invest $1.2 million in propane-air equipment during '57. (See GAS, April, 1957, pp. 50-54.) Throughout the nation increased emphasis is being placed on LPG plants. Battle Creek Gas Co. will increase LPG production plant in '57; Boston Gas Co. will increase its propane plant capacity; Central Electric & Gas Co. will add to its LPG peak shaving units; Chattanooga Gas Co. is constructing additional propane storage tanks; Greenwich Gas Co. plans addition of a 30,000-gal. propane tank; a 10,000 Mcf/day propane-air plant is planned by another company; and one company reported it will purchase land for a future propane-air plant.

Manufactured gas plants continue to be up-graded and maintained. One company will add a new gas condenser and oil storage. Another will install new dust hoods on oil gas sets; and a New England utility will install a new cooling system for its manufactured gas plant. A Midwestern utility will remodel its purifier house, install gas and oil burners in boilers, and complete the installation of a Hasche gas-making unit. ■

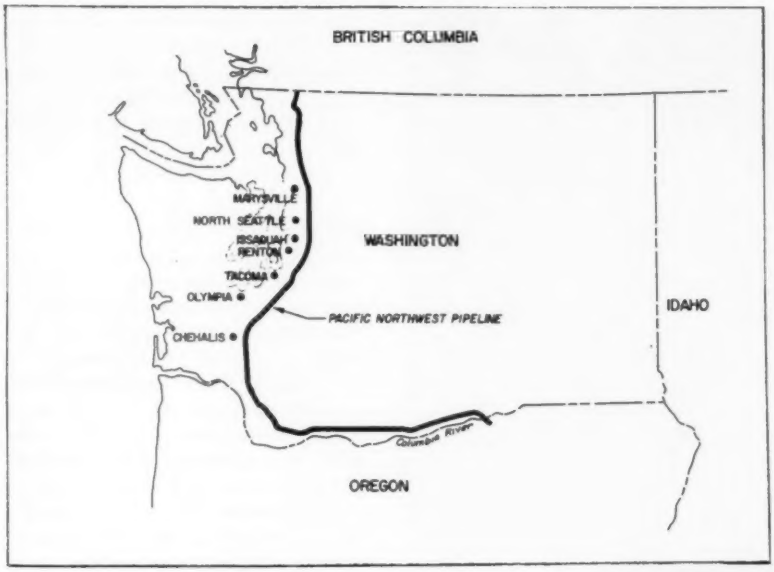
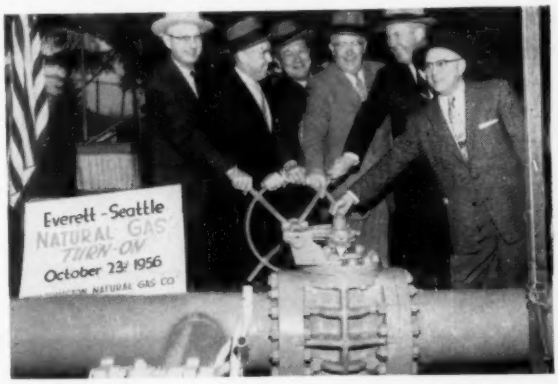


Fig. 1. Washington Natural serves a 125-mile area in eastern Washington between Marysville and Chehalis. Five city gate stations were constructed at North Seattle, Renton (South Seattle), Issaquah, North Tacoma, and Chehalis. A sixth station is planned for construction this summer near Olympia.

The valve-turning ceremony (below) at Seattle-Everett city gate station symbolized arrival of natural gas in the Puget Sound area.



Design your city gate stations for the future

By CARROLL V. KROEGER, Distribution Engineer
Washington Natural Gas Co., Seattle

OPENING a valve at Washington Natural Gas Co.'s Seattle-Everett city gate station on Oct. 23, 1956, put the last of five stations into operation measuring natural gas into the Puget Sound area. Five million dollars were spent to bring this service from Pacific Northwest Pipeline's Scenic Inch to the company's existing distribution systems. Washington Natural serves a 125-mile area between Marysville on the north and Chehalis on the south (*Fig. 1*). More than a million people live in this heart of the growing Puget Sound basin.

Initial construction plans called for the installation of 87 miles of supply mains to connect the city gate stations to the existing systems. Five city gate stations were designed and constructed to control pressures, measure flows, and condition the natural gas before delivery into the distribution systems of the numerous towns and cities served by the company. Land for the gate station sites was purchased during the spring of 1956, adjacent to the transmission line. Actual construction commenced during the summer months. All stations were completed on schedule prior to the arrival of natural gas in the area.

The first station to receive natural gas was the Chehalis station on Oct. 9, 1956. This station was located between the towns of Centralia and Chehalis. It serves the southernmost portion of the company's franchised territory. The second station served was North Tacoma, located east of Tacoma, serving the city of Tacoma and the town of the Puyallup Valley.

The third station placed in operation was located near Issaquah, and served a new distribution system east of Lake Washington. A unique feature of the planning for this area was the construction of several new distribution systems independent of the company's existing facilities to serve a rapidly growing suburban area. These systems were served with propane vapor for approximately eight months prior to the arrival of natural gas.

The fourth station to go on the line was South Seattle. Located near Renton, this station served the South Seattle industrial area, and the Renton-Kent system. The fifth station, Seattle-Everett, was a dual station located approximately half way between Seattle and Everett. It serves all of Seattle north of the Lake Washington ship canal, and

GAS exclusive

Fig. 2. Seattle-Everett station grounds were planned to incorporate trees into landscape. Building is painted pastel two-tone green to blend with natural surroundings.

the city of Everett. During the summer of 1957, the city of Marysville will be added to its load. A sixth station has been planned for construction during the summer of 1957. This Olympia station will provide the state capitol with an adequate supply of natural gas for domestic and industrial consumption.

A number of factors were given consideration during the design of these five stations. Among these were:

1. Site location.
2. Station layout.
3. Cathodic protection.
4. Equipment housing.
5. Odorization and quality control.
6. Instrumentation.

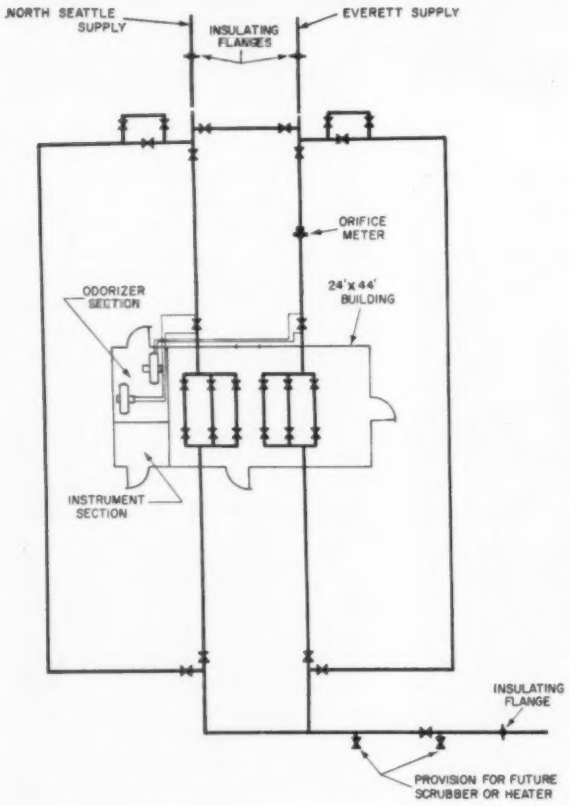


Fig. 3. Schematic plan of dual station. Station by-pass provides operating flexibility for equipment maintenance or future changes. Stubs equipped with valves and blind flanges provide for future heaters or scrubber installations.

Site location

A city gate station is the vital link between the pipeline supplier and the supply system which feeds the distribution network of the towns and cities. The first step in the design of a city gate station is selection of a suitable site. Factors given consideration included proximity to the transmission line and distribution systems, accessibility, and allowance for future requirements. Approximate locations were selected during a conference with the pipeline supplier. These were selected after a study of aerial photographs which enabled the elimination of locations which were not satisfactory because of building densities or undesirable topographic features. Field trips were necessary to determine accessibility and other features not available from the photographs. Since it was not desirable to undertake condemnation proceedings, alternate locations were selected in the event that acquisition of the first sites could not be secured. Land ownership in the vicinity was determined and options for purchase signed.

To permit expansion, a minimum of one acre was required for construction of the pipeline measurement station and the distribution company city gate station. Usually, a much larger tract was purchased to provide for future peak shaving facilities. This was desirable also to limit hostility of neighbors in the event the areas eventually grow into residential areas.

In three areas it was necessary to apply for rezoning. This land was zoned for agricultural use at the time the options for purchase were signed. When the Board of County Commissioners approved the rezoning applications, the sale of the property was completed. All but one site was accessible to county roads or highways. In this case, the station location was adjacent to a platted county road which had not been developed. Permission was obtained from the county to

open and construct the roadway for access to the property.

Each site was surveyed to determine ownership boundaries. Topographic maps were drawn and grading plans laid out. Station layout incorporated as much of the existing landscape into the plans as possible (*Fig. 2*). Since the stations were to be unattended, and designed for uninterrupted service, protective fence was required. Eight-foot high, chain-link fence was installed around each station with provision for a 12-ft, double-swing, drive gate at the driveway. Each station was provided with a crushed stone driveway, and parking and turn-around area. Station signs were installed on the fence near the drive gate for identification purposes. "No smoking" safety signs were placed on the doors of the station buildings.

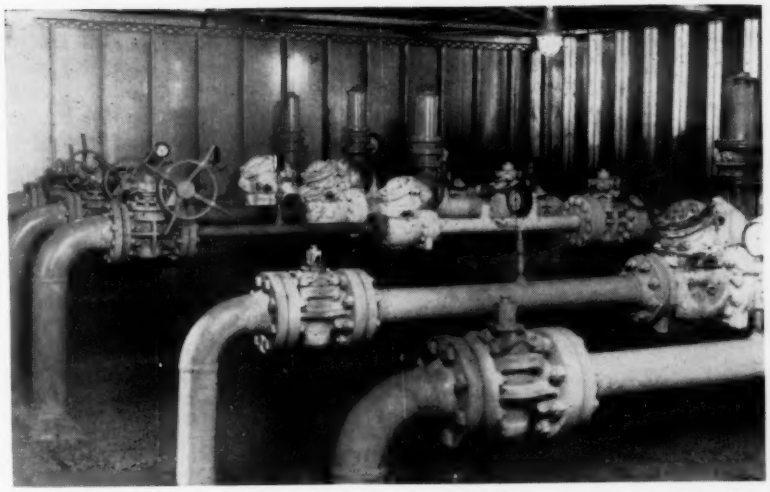


Fig. 4. Regulators are manifolded in parallel on riser with common inlet and outlet headers. Since initial flows are low, small regulators will be replaced as loads grow. Headers are buried in crushed stone floor to dampen noise. Interior building lighting is equipped with explosion-proof fixtures.

Station layout

The layout of all stations is identical with the exception of the dual purpose Seattle - Everett station. The equipment arrangement was compact with all equipment housed in prefabricated steel buildings. Since limitation of area was not an item of strict consideration, the station layout was symmetrical. An interesting feature of the design (*Fig. 3*) was the station by-pass, which enables the entire station to be by-passed for maintenance or equipment changes and additions.

Transmission pressures up to the pipeline measurement stations are high. The temperature drop as a result of pressure reduction could cause severe stresses and strains on piping and flange. Design calculations pointed out that gas temperatures could be expected to drop below the freezing point on the outlet side of the city gate station, regardless of the ambient temperatures. Sufficient flexibility was designed into the piping to relieve any stresses or strains resulting from temperature variations.

Provision was made on the inlet side of the station for future installation of heating equipment when required. When a new line is placed into operation, it is normal to experience a period of excessive moisture followed by dust after the line has dried out. Stubs equipped with valves and blind flanges were installed on the inlet to all stations to provide a means of installing future scrubbers as required.

The design and construction of all stations was in accordance with the code for pressure piping, ASA B31.1.8-1955, "Gas Transmission and Distribution Piping Systems." The requirements of the rules and regulations governing the construction of gas distribution systems set forth by the Washington Public Service Commission were also met or exceeded. All pipe was schedule 40, seamless steel, API-5L, Grade B, and of welded construction. ASTM A181 flanges were installed at points to allow valve and equipment changes. Studs were manufactured of ASTM A-307 Grade B steel, with continuous rolled threads ASA B11 coarse series, class 2 fit. Nuts installed were semifinished heavy hexagonal head, conforming to ASA B18.2. ASTM A234 welding fittings were installed

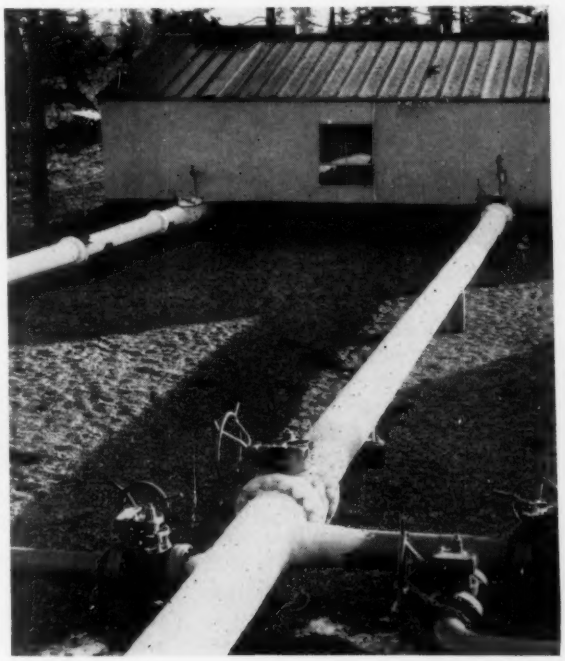


Fig. 5. Orifice meter tube is installed on Everett station outlet (upper left). Security measures provide for locking exterior wheel valves as well as building doors and fence gate with series locks. Yard area is treated for plant control and is covered with crushed stone.

Carroll V. Kroeger joined Conversions & Surveys Inc. in 1946 after he was graduated from the NROTC Unit at Rice Institute. In 1949 he received a degree in mathematics and physics at Vanderbilt University and joined Blackstone Valley Gas & Electric as a cadet engineer. After seeing duty in the Navy from 1950-1952, he joined Central Indiana Gas Co. In 1956 he went with Washington Natural as assistant chief design engineer. During the preconversion period he was responsible for the design and installation of all control equipment. Early this year he was named distribution engineer and is now responsible for all company development planning.

throughout to limit noise factors, and for high flow efficiency. Rockwell-Nordstrom 400-lb, figure 1489, worm gear-operated, semi-steel valves were installed at above ground locations. For underground locations, Nordstrom figure 1487, spur-geared valves with watertight gear housing and extensions were specified. All welds were made by welders certified under API standard 1104 or AWS tests for electrode arc process. All welds were X-rayed and inspected by qualified welding inspectors before acceptance.

The station design pressure is in excess of 300 psig, however, it is not expected that operating pressures will exceed 200 psig during the first five years of operations. Each station was tested at 450 psig air test in accordance with code requirements, before being placed into operation. The total capacity for the five stations is well in excess of the fifth year estimate for firm gas requirements.

Standard regulators were selected in which the body size could be based upon estimates of future loads, and restricted valves sizes installed for initial use. Three such regulators were manifolded in parallel on risers with common inlet and outlet headers (*Fig.* 4). Each header is anchored on concrete pads which extend below the frost line. Each header is provided with a blind flange for future expansion. There is space for installation of a meter tube on the outlet side of the station. One such orifice meter tube has been installed on the outlet side of the Everett portion of the dual Seattle-Everett station (*Fig.* 5). Blowoffs equipped with wedge-type gate valves are provided on each pipe section. Indicating gauges with needle valves were installed upstream and downstream of the regulators.

Cathodic protection

Mild soil condition exists throughout the Puget Sound area. There are, however, localized 'hot spots' which present severe corrosion problems. All underground station piping was millwrapped with a double coating of semi-plasticized, coal-tar enamel reinforced with a mat of fiberglass, and covered with 80-lb kraft paper. The stations were isolated electrically from the transmission metering stations and the distribution supply mains by insulating flanges. All aboveground pipe, valves, and fittings were sandblasted to remove mill scale and coated with a 5-mil coating of epoxy-resin paint. Epoxy-resin has unusual corrosion resistant properties. It withstands severe impact, is flexible, resistant to chemicals and abrasion, as well as moisture. Since the temperature of the gas receiver was near the freezing point, moisture condensation on the outside of the pipe and equipment (*Fig.* 6) made coating of the exposed piping and equipment a necessity. Cathodic protection was not installed. However, test leads were provided for periodic setting of instruments to determine future protection requirements.

Equipment housing

All station equipment was housed in prefabricated steel buildings. These served a number of purposes: to protect equipment from the elements and vandalism, to protect personnel during equipment maintenance, noise abatement, odorant control, and landscaping. Prefabricated steel buildings were selected for several reasons; they were fireproof, economical, easily erected, and could be easily enlarged. Since these stations could be surrounded by residential areas in the future, a structure was selected which did not have the usual industrial appearance. It consisted of flat, self-supporting and load bearing, lock seam, exterior side wall panels,

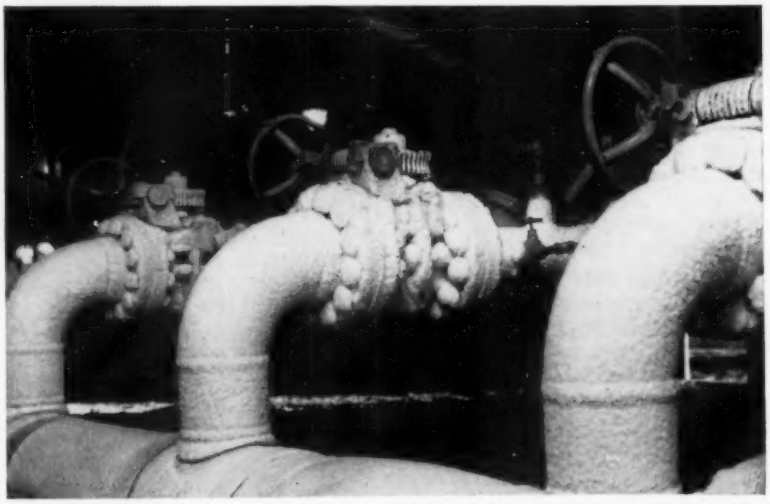


Fig. 6. Above ground piping was painted with epoxy-resin corrosion-resistant paint. Gas temperatures are below freezing point, causing moisture to condense from atmosphere and cover piping with coating of frost.

with a gable-type roof. It lended well to various architectural treatments, could be expanded easily, or disassembled and moved to a new location. Maximum building size was 24 ft x 44 ft x 8 ft at the Seattle-Everett location and a minimum size of 16 ft x 16 ft x 8 ft at Chehalis.

Building specifications called for a minimum of two doors for emergency exit, adequate windows and plastic skylights for natural illumination, with ridge vents and louvers for ventilation. The buildings were erected upon concrete foundations and footings. The equipment sections were provided with concrete floors with the exception of the pressure regulation section. All major station buildings provided two rooms separated from the regulator room by vapor-tight walls and ceiling. One of these housed the odorization equipment. The second enclosed the instrument panels and quality control equipment.

Maintenance could not be limited to the daylight hours. Therefore all locations were provided with electric power, both within and outside. Explosion proof wiring and lighting fixtures were installed. Clusters of flood-lamps provide yard illumination. Building exteriors were painted a pleasing two-tone green finish to blend into the surrounding landscape. The yard area was treated with chemicals for control of plant growth and covered with crushed stone.

Odorization

The city gate stations were selected as the logical location for the injection of odorant into the natural gas. These locations provided both lower installation costs and the best odorant control since hourly and daily measurements were available to check the odorization rates. In addition, because of the nuisance character of gas odorants, it was desirable to locate odorizer facilities at points remote from residential areas.

Two types of odorizing equipment were selected for installation at the gate stations. Direct injection type odorizers were installed at the large volume stations (*Fig. 7*), and evaporation type was specified for the smaller class

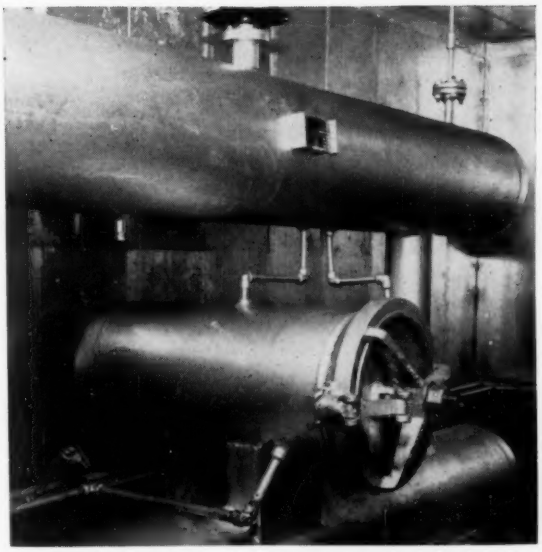


Fig. 7. Direct injection type odorizing equipment is enclosed in a room sealed off from remainder of station building by vapor-tight walls and ceiling. Room floor is steel to allow for easy clean-up of spillage.

stations. In order to operate at high flow ratios, mainline plug valves were utilized to produce the necessary operating differential. Because of the nuisance character of the odorant, it was necessary to house the odorizer equipment in a room separated from the other equipment. This room was sealed with a vapor-tight barrier to prevent any odorant released within the room from diffusing into the outside areas. The floor of the room was concrete. However, because of the high porosity of concrete, a steel floor was installed to allow easy cleanup of spillage. Although the room was vapor tight, a vent was provided to exhaust room contents to the atmosphere in the event of leakage. A filterbox and blower with explosion-proof motor (*Fig. 8*) will exhaust the room contents through activated charcoal to neutralize the gas odor. Since the odorizer tanks and lines must be depressured to facilitate the filling of the storage tanks and for equipment maintenance, a waste gas burner was installed in the yard for disposal of large quantities of vented gases. All odorizing equipment, connecting lines, and fittings were of welded construction to limit leakage.

Fig. 8. Filter box containing odor-neutralizing activated charcoal exhausts odorizer room contents to the outside atmosphere. Blower motor is explosion proof.

Instrumentation

A city gate station is the heart of a distribution system. Any difficulties experienced by the pipeline supplier, or malfunctioning of measurement and regulation equipment, initially affects the gate station, and, later, the distribution system itself. The dispatching of gas loads requires an immediate knowledge of the measured flows and pressures at the gate station location. The gas dispatcher must have available at all times the differential and static readings of the pipeline billing meters. Pacific Northwest Pipeline provided taps on the side of the orifice fitting opposite the taps used for the billing meters, for this purpose. These flange taps were connected to Bris-

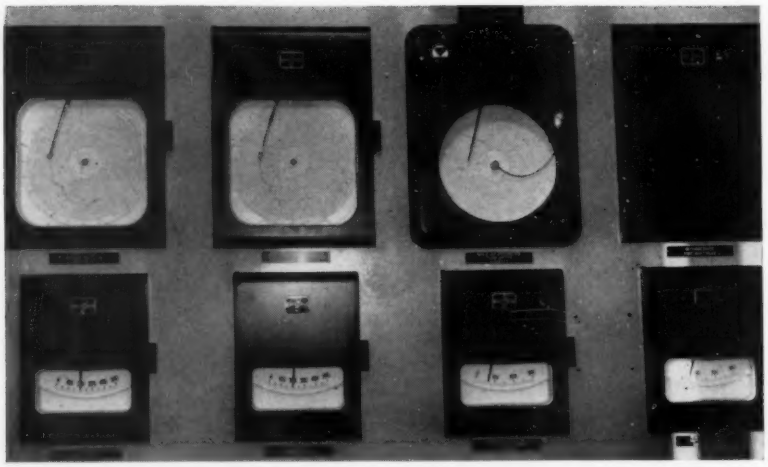


Fig. 9. Telemeter transmitters mounted on steel instrument panel at city gate stations transmit essential information to the gas load dispatching center. Time multiplexing equipment enables signals to be transmitted over a single leased telephone circuit. Recording flow transmitter duplicates pipeline billing meter charts. Instruments are housed in a vapor-tight room in city station building.

tol, 5-sec. impulse, pressure metameters and recording flow transmitters. The latter records at the gate station on a chart which is a duplicate of that on the pipeline billing meter. A pressure transmitter also was provided to transmit the outlet pressure of the city gate station.

Because of the number of signals to be transmitted from each station, a study of leased telephone charges determined that installation of multiplexing equipment would be economical. Time multiplexing equipment was selected for this purpose. Time multiplexing consists of transmitting a number of signals over a single circuit on a time sequential basis. The equipment consists of a transmitter and receiver, with scanning switches maintained in synchronism. Because leased telephone rates are based upon the number of signals transmitted simultaneously, the rental charges for a leased circuit for a system which can transmit as many as 15 signals is the same as for a single telemeter circuit. All of the telemeter equipment was mounted on a steel panel board (*Fig. 9*) and installed in a separate room of the gate station building. This room was isolated from the other portions of the building by a vapor-tight barrier. The room was vented to the atmosphere to exhaust any leakage from instrument piping. Because of the remote location of the stations, a telephone voice handset was installed in the instrument room to provide immediate communication for maintenance crews who might need facilities during any emergency. All telemeter signals are received and recorded on a panel board at a central load dispatching center in Seattle (*Fig. 10*). Equipment was mounted on formica-faced instrument panels. The pressure receivers were equipped with high and low alarm contacts which sound an audio alarm and light a visual alarm bulls-eye mounted on the instrument case.

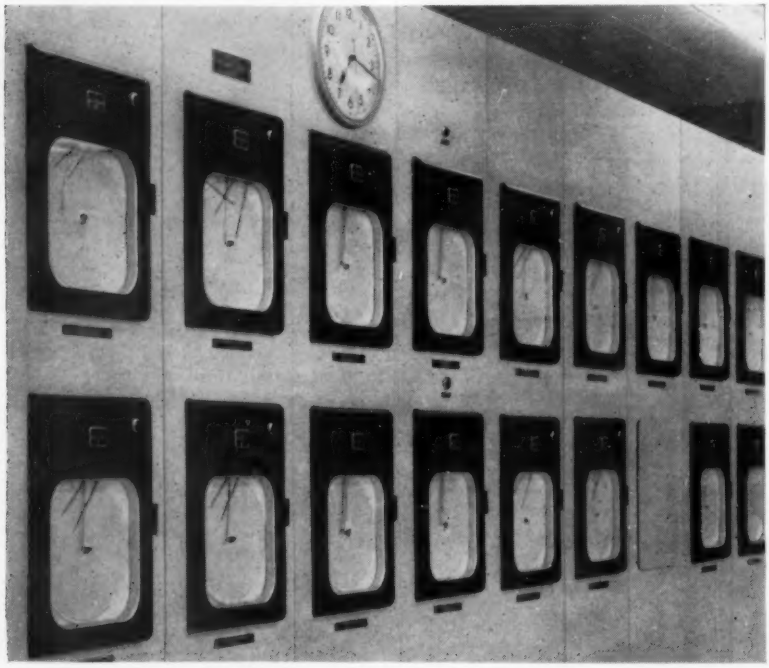


Fig. 10. Signals from city gate station telemeters are received at load dispatching center. Pressure receivers are equipped with high and low alarm contacts to warn of equipment failure.

The inlet to each station is provided with temperature wells for recording temperature instruments. At the present time one recorder has been installed and additional units will be installed as needed. The instrument rooms were made large enough for installation of a recording gravitometer and calorimeter. Initial plans called for the installation of these instruments at two of the city gate stations. Plans later were altered and the gravity and Btu recorders were installed at the city border stations. In the future, when peak shaving equipment is installed at the gate station locations, these instruments will be relocated in the gate instrument rooms.

It is impossible to provide a design which will meet with all of the requirements of the future. However, it is possible to provide for as many contingencies as can be anticipated at the time a new installation is constructed. Within practical limits these provisions have been made the keystone of design for Washington Natural's new city gate stations. ■

Practical aspects of analysis with an electronic computer

By G. G. WILSON, D. V. KNIEBES, and R. T. ELLINGTON
Institute of Gas Technology, Chicago

Electronic digital computers are a relatively new engineering tool that can be used to speed the solution of many numerical problems. The Institute of Gas Technology has used its computer to perform gas network flow calculations for a number of companies on a service basis. The experience obtained in the solution of these problems has led to many refinements which speed the solution of problems and reduce chances for error. This paper discusses these refinements and some of the important characteristics of the modified Hardy Cross method of solution.

THE accelerated development of high-speed computational machines since World War II has resulted in the application of these tools to a great number of time-consuming and difficult problems. Recent work has shown that they can be of great assistance to the gas industry in the solution of a number of types of problems. One such problem is analysis of the impact of load growth on distribution systems and other pipeline flow networks. This type of analysis is proving especially useful in planning construction programs.

Punched card accounting machines[2] were among the first high-speed computers applied to the solution of network flow problems. Recently, high-speed electronic digital computers have also been applied to this problem, and the Institute of Gas Technology has provided computer solutions of network flow problems on a service basis since 1955.

A general program has been developed for the institute's ALWAC III computer which can be used to solve any network flow problem within the computer's capacity. This program, which is based on a modification of the Hardy Cross procedure, has been used for the solution of 21 problems ranging in size from 64 to 672 pipe sections for the Northern Illinois Gas Co., and demonstration problems for six other gas utility companies. In this article, practical aspects of the use of a digital computer to solve

network flow problems are discussed to assist gas utility companies in evaluating the feasibility of using this valuable tool to solve their own problems.

Characteristics

A digital computer performs arithmetic operations with extreme rapidity. All of the digital computers currently on the market can be instructed to perform a number of operations which include internal checks, operation sequences, information transfer and storage, as well as calculations. An important advantage of automatic digital computers, in addition to their speed, is their memory unit which can be used to store data and associated instructions for the computation of large and detailed problems. The computer will operate on the data in accordance with the stored instructions until the problem is solved and the answers have been recorded. It should be noted that one of the distinguishing characteristics of each type of computer is its system of operating instructions, so that a general program developed for one computer is not immediately usable with another.

The institute's computer, (*Fig. 1*) is an ALWAC III, a general-purpose, medium-speed computer manufactured by Alwac Corp. (formerly Logistics Research Inc.), Redondo Beach, Calif. The operating "vocabulary" of this computer consists of 76 basic operations, several of which are used in a sequence called a program, to carry out a computation. Particularly useful programs, called sub-routines, are permanently stored in the computer and used in virtually the same manner as one of the operations comprising the computer's original operational vocabulary. Programs for calculating e^x, sin x, etc., have been stored in the computer and can be used whenever needed to perform more complicated operations.

Since a digital computer requires a definite instruction to perform each step of a computation, the general network flow program had to be based on an orderly mathematical procedure. The procedure selected was a modification of the well-known Hardy Cross[1] method as described by Trunk[3] and Sickafoose[2]. The modified procedure differs from the original in that each loop flow correction is immediately applied to the flow rates in the pipe sections comprising the loop before the flow correction for the succeeding loop is calculated.

The preparation of a network flow problem for solution by use of the Institute's digital computer program involves the following steps:

1. A "squared" network diagram of the problem is prepared and the gas loads, pipe resistance factors, and initial assumptions of the flow rates for each pipe section, are tabulated on this map.

2. A check is made of each point at which pipe sections inter-

sect to assure that the sums of the gas flows entering and leaving the intersection are equal (Kirchhoff's first law).

3. The pipe sections and elementary loops on the diagram are numbered. To simplify the coding these numbers also designate unit storage locations in the computer.

4. The pipe resistance factors, derived from the flow equation employed, and assumed flow rates are tabulated in numerical order for each pipe section.

5. A loop code is prepared for each elementary loop and for paths between gas sources feeding the network. This code provides the information that is required by the computer program to associate the proper pipe sections with each loop.

6. The pipe resistance factors, assumed flow rates, and the loop codes are punched on paper tape, since the computer can read information in this form most rapidly. The tape is then used to feed the basic information into the memory unit of the computer.

The tapes prepared in step 6 form a permanent record of the tabulated information for the problem and can be used to feed the same problem back into the computer at any future time. These tapes are also easily changed to conform with changes in the network. These characteristics are particularly useful where repeat analyses of a distribution system are to be made because of system modifications and revised load estimates.

Once the problem data are stored in the memory unit of the computer, the network flow program is put into operation to obtain a solution. At present, the progress of the solution can be followed by either: (1) a print-out of the Hardy Cross flow correction for each loop as soon as it is determined; or (2) a print-out at the end of each iteration of the problem of the number of loops for which no flow correction was required, of the number of loops for which the flow correction was less than an arbitrarily assigned value, and of the sum of the absolute values of all of the loop flow corrections. The computer program could easily be modified to print-out other information such as the algebraic summation of the pressure losses about each loop.

When the problem is judged solved to a sufficient degree of accuracy, as indicated by the information printed-out during the course of solution, the computer is stopped. Another program has been developed which will calculate the value of the pressure loss for each pipe section in the network and print values out in tabular form in the order in which the pipe sections are numbered. The calculated flow rate for each pipe section is also tabulated. These tabulated results are then plotted on the network diagram. To ascertain the accuracy of these results, each intersection is checked to assure conformity of the flow rates with Kirchhoff's first law and the total pressure loss from several gas sources to several locations in the network are calculated for different

paths and checked against each other.

Additional information on the digital computer solution of network flow problems by use of the program developed at IGT has been presented in a previous paper.[5] A recommended procedure for the preparation and presentation of the basic information required to solve a network flow problem from basic distribution system data is available on request from the Institute.

This general program can be used to solve almost any commonly occurring network flow problem of such size that the capacity of the computer's memory unit is not exceeded. It is estimated that the Institute's ALWAC III computer, whose magnetic drum memory will store 4096 ten-digit decimal numbers or their equivalent in instructions, could handle problems up to 450 loops and 1200 pipe sections in size. The largest problem solved to date has been one of 204 loops and 672 pipe sections.

Requirements

After the initial development and testing of the network flow program for the computer, the personnel required to solve problems are an engineer and a well-trained technician. It has been found that all of the checking and tabulation of the basic problem data, including the preparation of the punched paper tapes, all of the checking and tabulation of the results, and even the routine operation of the computer itself, can be done by a competent technician. Most of this work is clerical in nature but must be done with extreme care to prevent errors. The engineer supervises the over-all solution of the problem and his duties include:

Contact work between the computer center and the company submitting the problem.

Assuring that all data submitted with the problem are interpreted properly.

Making decisions which require a knowledge of distribution design.

Assisting the technician in checking the tabulated data for accuracy.

Assisting the technician in trouble shooting any computer difficulties encountered during the solution of a problem.

Judging whether any errors, discovered after the results have been plotted, have sufficiently affected the accuracy of the solution to warrant re-entry of the problem into the computer.

Devising forms and procedures which will help to improve the efficiency or accuracy of the entire problem-solving operation.

To carry out these duties effectively, it is desirable that the engineer be familiar with the principles and practices of distribution system design and that he have sufficient knowledge of the operation of the computer to be able to program simple problems and to comprehend more complicated programs. As the volume of network problems increases, additional technicians can be added as needed, but one engineer is probably capable of supervising the total volume of flow problem work that a computer the size and speed of the ALWAC III is capable of handling.

In addition to the engineer and one or more technicians, the services of a competent computer programmer are required from time to time. The programmer develops and tests the general program, helps trouble shoot unusual difficulties encountered with the computer during the course of a solution and works out modifications of the general program that are found desirable on the basis of experience.

The time required to solve network flow problems is roughly proportional to the number of pipe sections in the problem. However, it has been our experience that problems of 250 to 400 pipe sections in size can be solved most efficiently. The time requirements per pipe section are significantly greater on problems smaller and larger than this optimum size. The average time requirements per pipe section for 14 problems ranging in size from 100 to 672 pipe sections are as follows:

Technician	0.15	hours
Engineer	0.04	hours
Computer	0.025	hours

It is interesting to note that technician's time represents approximately 70 per cent of the total time required to solve problems and that the computer time represents only 12 per cent of the total. This fact is particularly significant in comparisons between digital and analog computers for the solution of network flow problems because the digital computer is available for other work while problem data or results are being processed. We have found that computer time represents approximately one-third of the total charges for the solution of most network flow problems.

Convergence

There has been some question regarding the convergence of the Hardy Cross method. Every problem that has been solved at IGT to date has continued to converge until the desired degree of accuracy was obtained. A convergence plot for a 43 loop network containing 10 regulators and 209 pipe sections is shown in *Fig. 2*. It is interesting to note that the numerical value of the correction summation

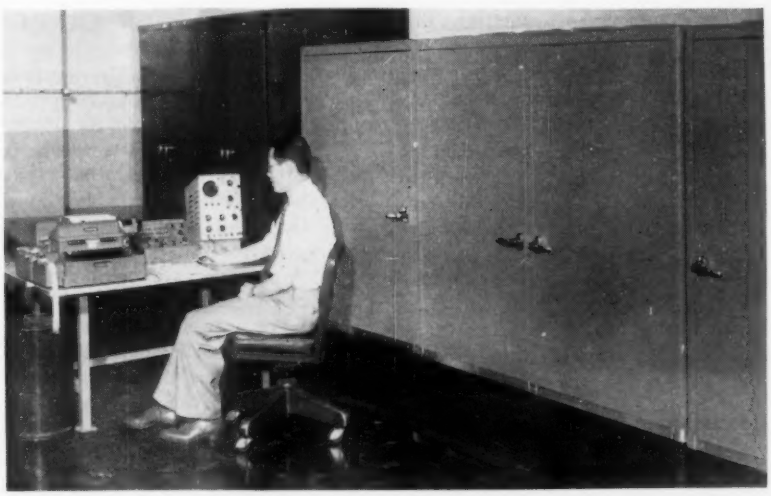


Fig. 1. Overall view of IGT's electronic digital computer.

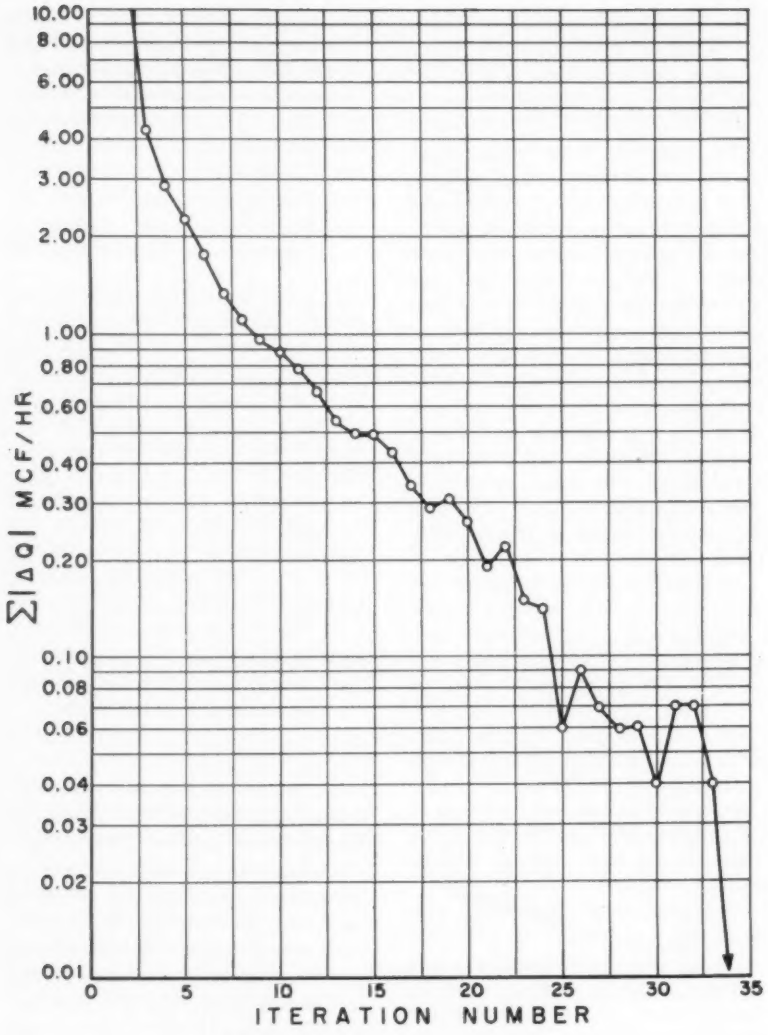


Fig. 2. Typical rate of convergence plot.

increased over the preceding value on several occasions after the 18th iteration but the general trend of the plot is always toward convergence.

At the end of the 33 iterations shown in Fig. 2, the network to which these data pertain was balanced to the point that none of the Hardy Cross loop flow corrections was greater than one one-hundredth Mcf/hr. After only 18 iterations, 30 of the loops had Hardy Cross loop flow corrections equal to or less than one one-hundredth Mcf/hr and no correction for the remaining loops was greater than three one-hundredths Mcf/hr. Thus, it is possible to considerably reduce the number of iterations, and computer time, if a slightly less accurate balance of the problem can be tolerated. In general, we have found that a problem balanced to the point that all of the Hardy Cross loop flow corrections are equal to or less than 0.05 Mcf/hr has been acceptably solved and the number of iterations required has been kept to a practical minimum. This value applies to an average distribution system network. For intermediate and high-pressure feeder networks, the maximum permissible value of this loop flow correction could undoubtedly be set at a higher value.

In the problems solved to date, the number of iterations required to achieve a balance to a sufficient degree of accuracy has varied from 15 to 60. A larger number of iterations is usually required for larger problems where each iteration is also more time consuming. On some of the larger problems the total effective computer time has run as high as 20 hours. For this reason we have continued to investigate methods which may increase the rate of convergence or decrease the time required for each iteration. The two general avenues of approach to the reduction of computer time are improvement of our present method of solution and exploration of other mathematical methods.

On the basis of the convergence behavior of problems already solved, the following general observations have been made in regard to factors affecting convergence.

The rate of convergence seems to be improved markedly if every possible low resistance path between feed points is treated as a closed loop.

Loops having both high flow low-resistance pipe sections and low flow high-resistance pipe sections seem to have the greatest tendency to give oscillating values for the loop flow correction. The greater the number of this type of loop in a network, the greater is the probability that the rate of convergence will be retarded.

Since the rate of convergence decreases exponentially with the number of iterations, the number of iterations necessary to obtain an adequate solution is not particularly dependent on the accuracy of the original assumption of flow distribution. Extreme efforts to refine the assumed flow distribution are probably not warranted. However, the accuracy of the solution desired does have a significant effect on the number of iterations required.

A device that might minimize the undesirable effect of low-flow, high-resistance pipe sections on convergence rate would be to eliminate pipe sections with unusually large resistance factors from the network. Elimination of this type of pipe section will seldom have a significant effect on flow distribution in the remainder of the problem.

Another tool that might prove useful in speeding convergence is

the modification of the calculated loop flow corrections before they are applied, particularly in the latter stages of the problem solution when the convergence rate is slow. The simplest modification of this type would be to multiply all of these correction factors by some constant.

There are also possibilities of speeding both the rate of convergence and reducing the time required per iteration of the modified Hardy Cross procedure by suitable modification of the computer program. One of the characteristics of digital computers is the variety of methods that can be used to carry out a specified type of calculation. A major revision of the Institute's general network flow program is presently in preparation. This revised program should simplify the preparation of the loop code and significantly reduce the time per iteration of a given problem.

If we are not able to significantly reduce the computer time required to solve network flow problems by use of the modified Hardy Cross procedure, we intend to pursue the possibilities of other mathematical methods such as those presented by Warga.[4]

The two basic types of errors that may occur in the digital computer solution of a network flow problem are computer errors and human errors. As is usually the case in this type of operation the majority of errors have been human. We have sought to minimize these errors by standardizing the form for presentation and tabulation of problem data, and by carefully checking all data before introducing it into the computer.

The form we have found most convenient for the presentation of the data required to solve a network flow problem is shown in *Fig. 3* in which:

→ 5.0 is the concentrated gas load in Mcf/hr, or cf/hr.

450 is the resistance factor, K, for the pipe section under which it is noted, times 10^n, where 10^n is a convenient scale factor to minimize the number of zeros in writing resistance factors.

→

25 is the original estimate of the flow rate in Mcf/hr or cf/hr with the arrow indicating the assumed direction of gas flow.

□ is a gas source.

In order to detect and eliminate human errors, the problem data and results are checked in the following manner:

1. *As soon* as the problem is received each intersection on the network diagram is checked for conformity of the initial assumed flow rates with Kirchhoff's first law.

2. *When all* of the problem data have been tabulated, an engineer assists the technician who prepared the tabulations to check them against the information plotted on the network diagram.

3. *After paper* tapes of the problem data have been prepared and used to introduce the data into the computer, a print-out of this data is checked against the tabulated data from which the tapes were prepared.

4. *After a* print-out of the final calculated flow rates and pressure losses has been obtained from the computer, these calculated flow rates are plotted on a copy of the network diagram and each intersection is checked for conformity of the flow rates with Kirchhoff's first law.

Any errors detected in the final checking step are reviewed by the engineer supervising the solution of the problem to determine whether the over-all accuracy has been affected to the extent that the problem should be re-entered into the computer.

Of the 27 problems worked to date, it has been found necessary to re-enter five into the computer. We anticipate that re-entry will be considerably reduced as personnel become more proficient.

When it is necessary to re-enter a problem into the computer the results obtained from the first computer solution are corrected and used as the initial flow rate assumptions for the second solution. This is readily done by use of paper tapes cut by the Flex-O-Writer output of the computer at the same time the print-out of the results was obtained. When this procedure is followed, the second solution is normally obtained with many fewer iterations than the first because it is necessary for the computer to balance only those portions of the network which were thrown out of balance by the errors.

Computer errors can affect the solution of a network flow problem in two ways:

1. An incorrect loop correction is calculated and applied.

2. An incorrect flow rate for a single pipe section is obtained and carried through the rest of the solution of the problem.

One of the characteristics of a relaxation type of calculation procedure, such as the modified Hardy Cross procedure, is that an error in a correction factor will have no effect on the accuracy of the final solution but will only increase the number of iterations required to obtain the solution.

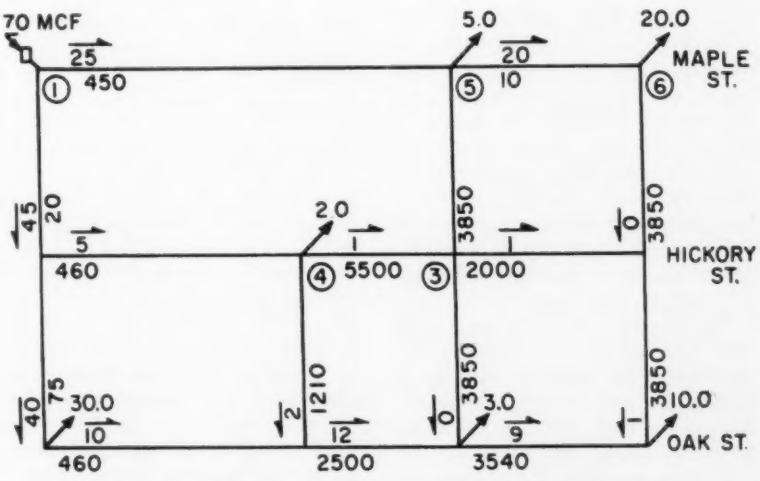


Fig. 3. Recommended form for presentation of network flow problem data.

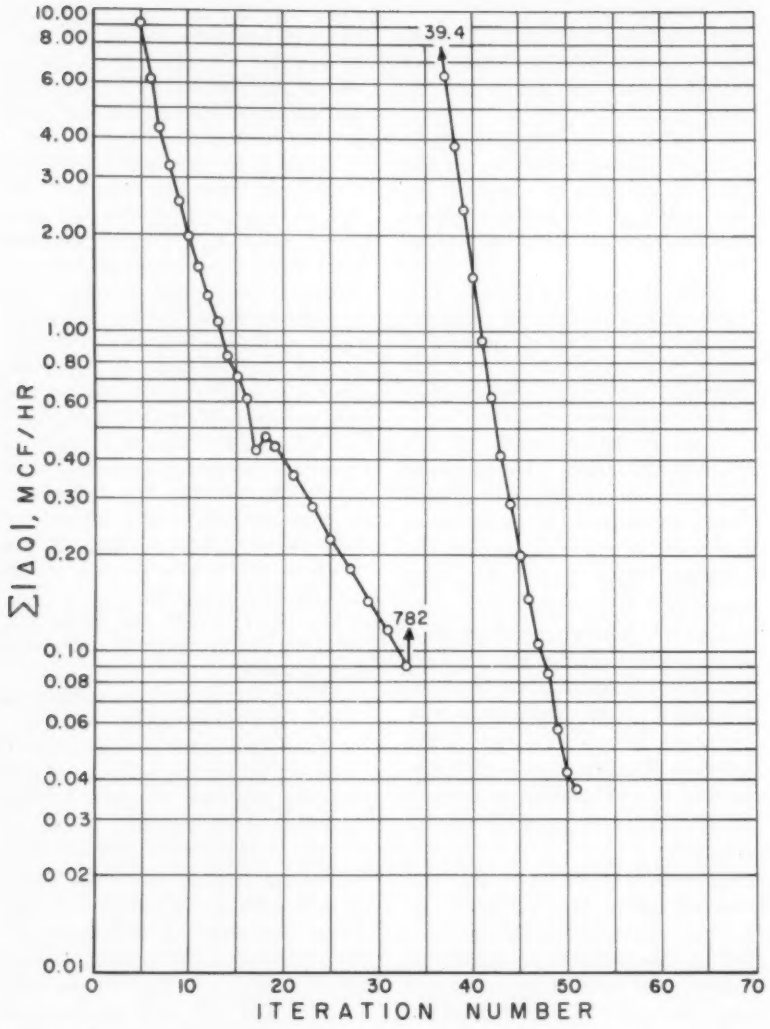


Fig. 4. Effect of a loop correction factor error on the convergence of a network flow problem.

A convergence plot for a network flow problem in which a large error in a loop flow correction factor occurred during the 34th iteration of the problem is shown in *Fig. 4*. The occurrence of the error was immediately apparent when the print-out after the 34th iteration was completed and the iteration of the problem was stopped. A print-out of the flow rate for each pipe section was then made.

The loop in which the error had occurred was quite apparent when the flow rates were plotted on a sketch of a portion of the network. All of the flow rates in this loop were impossibly large and in the clockwise direction. To reduce the adverse effect of this error, the flow rates in this particular loop were arbitrarily reduced to a reasonable size, these revised flow rates were entered into the computer, and the iteration of the problem was continued with the results shown in *Fig. 4*. The rate of convergence was about twice as fast as the original, because the balance in most of the problem had not been disturbed by the error. A solution of the problem to a satisfactory degree of accuracy was completed in 17 more iterations. It is difficult to estimate how many extra iterations were necessitated because of the error, but it was probably less than 10 out of a total of 51 iterations. The iteration of the problem could have been continued without revising any of the flow rates manually, but a significantly larger number of iterations would probably have been required.

One possible method of minimizing the adverse effects of loop correction factor errors would require a relatively minor change in the computer program. After the first few iterations of the problem, the computer could be instructed to compare each loop flow correction with a number slightly larger than any flow correction that might reasonably occur in the course of the solution and to recompute any correction which exceeded this number. This procedure would prevent the application of an abnormally large, erroneous flow correction.

Errors affecting the flow rate in a single pipe section are most likely to occur as a result of the improper application of a loop flow correction. Another less probable source of such errors is the improper transfer of flow rate information into or out of the computer's memory unit. Such improper transfer is improbable because of internal checks built into the instrument which stop its operation. In the procedure currently in use, random flow rate errors are carried through the solution of the problem and are not detected until the calculated flow rates are plotted and checked. Errors of this type could be detected as soon as they occurred if the computer program were modified so that every other pipe intersection was checked at the end of each iteration for conformity of the flow rates entering and leaving the intersection with Kirchhoff's first law. This program modification would include some provision for indicating the intersection at which a check was not obtained. After the manual correction of errors, the iteration of the problem would be continued. This program modification would also be helpful in detecting human errors in the problem data involving flow rates. This benefit is quite significant since it has been found that the most common human errors involve the tabulation of incorrect numbers or algebraic signs for the flow rates. The major disadvantage of this program modification is that it would require the preparation of an intersection code, similar to the

loop code, to indicate to the computer the pipe sections associated with each intersection to be checked.

Because of the nature of the modified Hardy Cross procedure, the majority of the mathematical operations carried out by the computer in the process of solving a network flow problem have to do with the calculation of loop correction factors whose adverse effects are rather easily minimized.

An important factor that must be considered in the solution of network flow problems is the total number of loops required to uniquely define their solution. We have concluded, first, that it is necessary to consider each elementary, or basic, loop in the network. Second, it is necessary to consider paths between regulators as fictitious loops. The number of these paths required is one less than the total number of regulators in the system. Each regulator must be so used at least once. We have not been able to devise a general proof of this conclusion but have been able to demonstrate it on a number of small networks and have found that results significantly in error were obtained for one problem in which one elementary loop was not considered.

Some network flow problems include regulators set at different outlet pressures. To handle this type of problem it is only necessary to specify the desired difference in squares of the pressures between the various regulators in the system and to order the computer to balance the flow rates along the regulator connection "loops" to these specified values rather than to zero. When the results of one network flow problem fed by regulators set at different pressures were tabulated, flow of gas backward into a regulator was indicated. This impossible result was caused by the fact that the outlet pressure at this regulator had been specified at too low a value in relation to the specified outlet pressures of other regulators in the system.

This article has been adapted from a paper titled "Practical Aspects of Distribution System Analysis with an Electronic Digital Computer," presented by Mr. Wilson at the AGA Distribution Conference April 8-11, 1957, at Houston.

Conclusions

Our experience has demonstrated that an electronic digital computer can be used to solve gas distribution system flow problems economically and to any desired degree of accuracy by use of a modified Hardy Cross procedure. The major advantages of this method of solution are as follows:

1. *A digital* computer is extremely versatile and can be used to solve a variety of engineering problems in addition to network flow problems.

2. *The computer* is available for other work during the preparation of problems for solution. As a result it is capable of handling an extremely large volume of problem work.

3. *A computer* can handle relatively large problems without skeletonizing.

4. *Once a network* flow problem has been solved on the computer, it can be re-entered in a matter of minutes. This feature is particularly useful when repeat analyses of a system are to be made from year to year with up-to-date revisions of system facilities and loading.

5. *The digital* computer solution of a network flow problem provides the flow rate and pressure loss in every pipe section in the network so that the distribution engineer can obtain a complete picture of the current status of the system.

6. *A well-trained* technician can handle a large portion of the labor involved in the solution of network flow problems including the actual operation of the computer.

7. *It is probably* the most rapid and economical method of obtaining a single detailed solution to a given network flow problem.

The major disadvantages of a digital computer for this work as compared to other methods of network analysis are:

1. *The method* by which the computer obtains the solution of network flow problems does not have the graphic appeal of electric analog methods.

2. *If a number* of solutions of the same problem with significantly different loadings are desired at one time, the computer time required to achieve solutions subsequent to the first will not be significantly reduced.

3. *The maintenance* requirements of digital computers are greater than those of analog equipment.

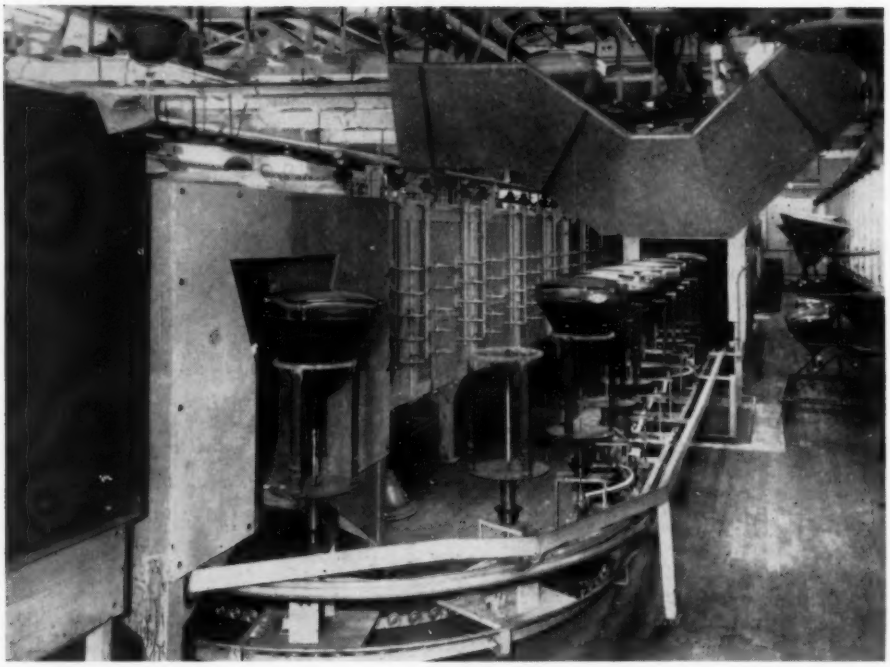
4. *It is time-consuming* to obtain information on the general adequacy of a distribution system during the progress of a problem solution.

The principal areas where further work is needed are the improvement of the convergence rate and the detection and elimination of errors. Because of the flexibility of digital computers, there are many possible methods of achieving this improvement.

The development of high-speed, moderately priced digital computers has made a powerful new tool available to the gas industry. Large companies may find the volume of their engineering problems makes it advisable to purchase a computer. The advantages of this equipment are also available as needed through computing services, such as provided by IGT. ■

REFERENCES

1. Cross, Hardy, "Analysis of Flow in Network of Conduits or Conductors," Bul. 286, University of Illinois Engineering Experiment Station, Urbana, Ill. (1936).
2. Sickafoose, Robert D., "A Punched Card Program for Calculating Gas Distribution Network Pressures by the Hardy Cross Method," A.G.A. Proc., 345-66 (1955).
3. Trunk, E. F., Murray, R. E., Bruns, J. R., "Use of the Hardy Cross Analysis for Calculating Gas Distribution Network Pressures," A.G.A. Proc., 596-602 (1953).
4. Warga, J., "The Determination of Steady State Flows and Currents in a Network," paper distributed by *GAS* at Distribution, Motor Vehicles and Corrosion Conference of the American Gas Association, Cincinnati, April 1955.
5. Wilson, G. G., and Kniebes, D. V., "Distribution System Analysis with the Electronic Digital Computer," *GAS* 32, 37-44 (1956) August.



Customer-sponsored research

By R. C. LE MAY • Selas Corp. of America, Dresher, Pa.

THE most successful method by which one industrial fuel displaces another is and will continue to be, the development of a better heat process. Yet gasmen continue to be surprised at successful inroads of energy priced much higher than their own. If their fine modern fuel is clean, flexible, convenient and reasonably priced, they ask, why shouldn't industry just continue to go buying it? The answer may surprise them.

Basically, the industrial customer is not primarily concerned with fuels at all. He *is* concerned with keeping his sales volume high, his production rolling and his employees happy. And as the justification for all this concern, he wants, of course, to make a profit. We hope that he does.

In our enterprise system, there is usually somewhere a competitive firm trying to take his business away from him, by making a better product at the same price, or an equivalent product at a lower price. To the extent that the competitor is successful, our customer must review his own operations and meet that competition—if he is to survive. There is no longer time for him to be complacent. Even if competition has not yet put him "on the spot," he probably feels enough competitive pressure that he is continually looking for means of strengthening his position. An analysis of what motivates him at this point will guide those who attempt to sell him either equipment or fuels.

To strengthen his competitive position, he must find ways to improve his product quality or to reduce his production costs without sacrificing quality. At that point, fuel prices and characteristics rarely enter the picture. Furthermore, as costs of labor and other items continue to rise, fuel becomes a smaller and smaller item in total production cost. His needs do not center around a fuel, but rather around a process. And to meet future requirements, that process must be better than the one he uses today. He will only then purchase the fuel required by the process he selects.

It should now be evident, except where fuels are used under boilers or as chemical raw materials, that the road to industral fuel sales lies through the introduction of improved method—either for holding existing loads or for displacing competitive fuels. This is a *two-way* road, either toward increased gas sales, or away from them—depending upon which fuel salesman

understands these basic factors and conducts himself accordingly.

When our competitor is doing the selling, and succeeds in taking load from us, we're all too inclined to look for excuses. His form of energy may be glamorous, he may use trick slogans, or perhaps we think he's guilty of unfair competition. Possibly his dirty fuel costs less than ours, per Btu at the burner. *So what!* If we don't raise our sights beyond fuel prices and characteristics, perhaps we deserve to lose the business. To sell that customer, we must be able to look through his eyes at the problem. So now for a moment, let us do just that.

We've already stated that our customer is usually seeking a process to improve product quality or reduce production costs. Although he will sometimes buy a process because it produces more in his existing floor space, quality and cost reduction remain his leading purchase motives. Where, then, will he learn of improved processes? Well, he probably reads a few trade magazines, belongs to one or more engineering or trade associations and listens to the grapevine. He receives sales and service visits from equipment vendors, power sales engineers and industrial fuel salesmen. If they're on their toes, all of these visitors bring him late bits of pertinent news from his industry, and attempt to keep him informed of the latest processes.

Our customer attempts to evaluate all the bits of information which he receives, of possible interest to him. Then, as part of planned expansion or renovation, he arranges to install those up-to-date processes which he requires and can afford. This procedure usually enables him to meet existing competition.

But what about his competitor who first upset the market by improving quality *beyond*, or reducing costs *below*, what could be produced by continually comparing practice with that of others and by merely remaining competitive. That competitor was a pioneer who earned a substantial advantage for quite a period of time, and presumably made enough money then to improve his position materially. He and those who cooperated with

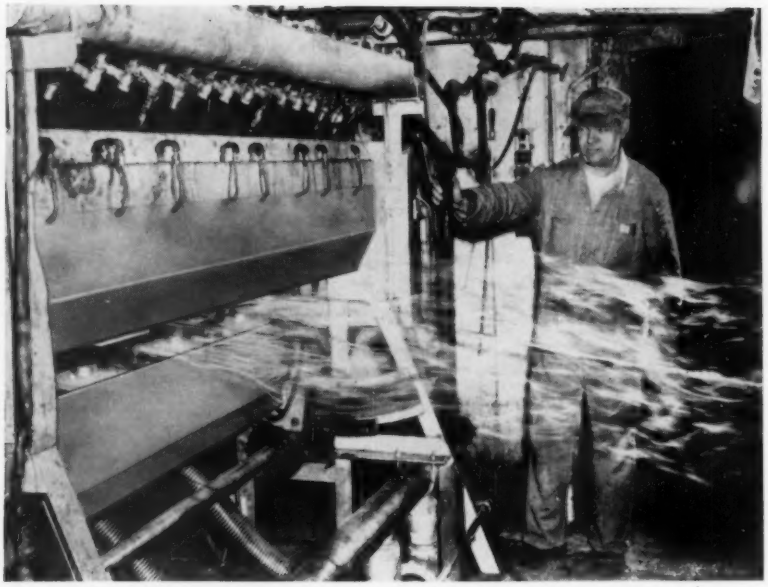
Some customer-sponsored research and development projects

Fire polishing of glass baking dishes
Fire polishing of glass stemware
Improved tin can soldering
Curing of coatings on tin cans
Tinning one side of sheet metal strip
Production of Christmas decorative glass
Oxidizing materials for railroad battery cells
Heat treatment of upset steel tubes
Curing coatings on motor and transformer laminations

*****

Several customer-sponsored projects are described and illustrated on the following pages

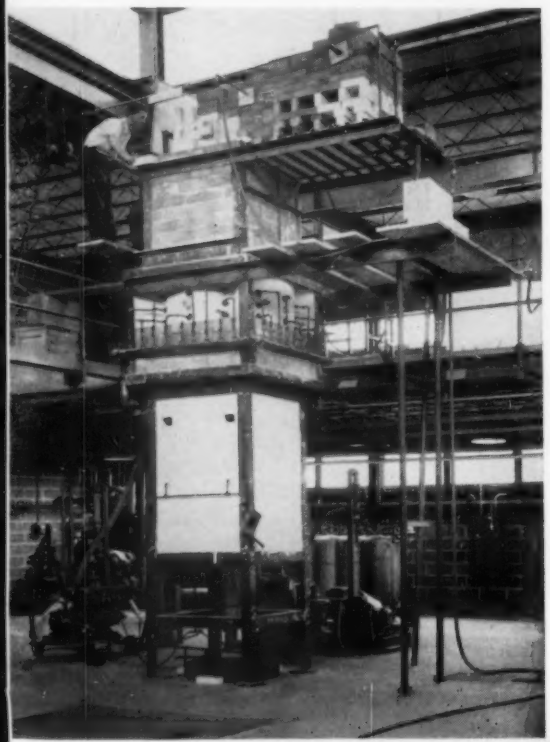
Gear tooth hardening had brought about the installation of much oxy-acetylene, induction, and electric salt bath equipment. It was felt that savings could be realized if utility gas could be directly and satisfactorily applied to gear faces. Reasonable assurance was required before production units were purchased, so potential customers have paid for laboratory heat treatment of their gears, followed by actual field tests with gears in service. A gear is shown here during lab heat treatment. Incidentally, the user of this machine has reported that the gas-fired unit cost one tenth of what his competitor had paid for an induction-heated process turning out similar gears at the same rate.

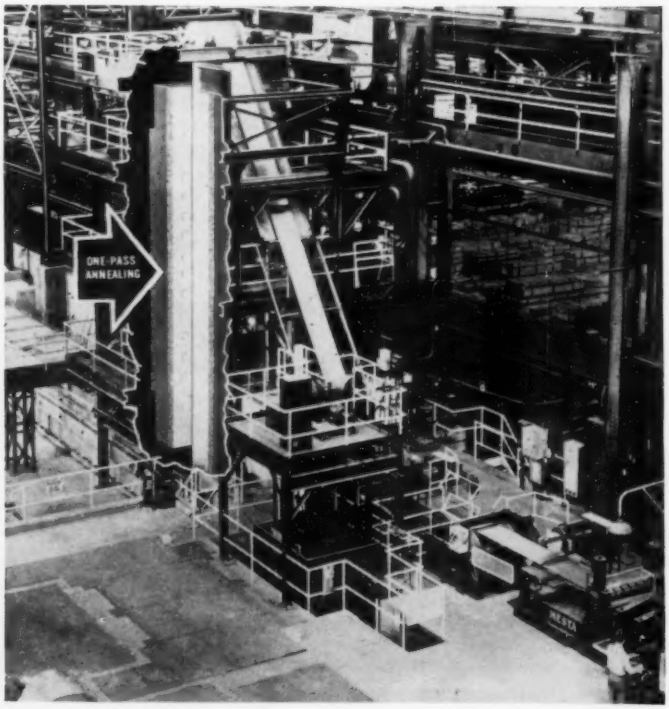


Superfine glass fiber is blown, after steam jets had been displaced by high temperature, high velocity gas streams from specially constructed burners. Licensed to most of the large glass fiber producers, this process now consumes large volumes of natural gas. The patent holder is quite happy with his sponsorship of the project because from it a new and better product resulted.

User-sponsored processes

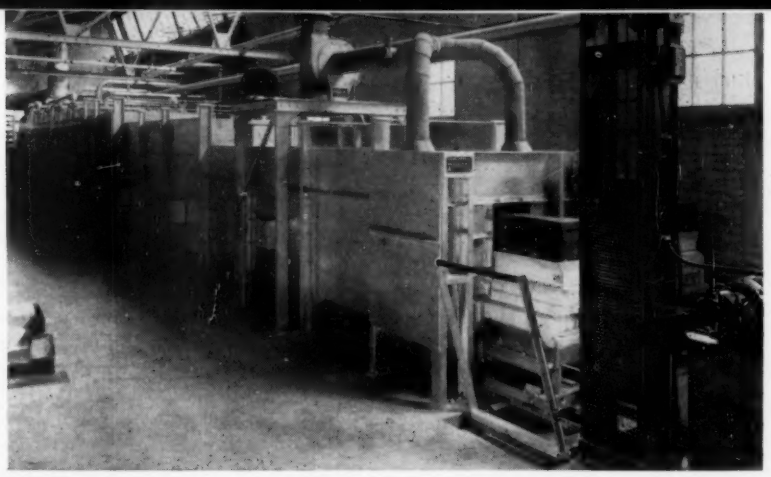
A trade group in the clay products field expressed interest in having a new product with highly desirable properties not heretofore available. To secure this, it sponsored an investigation involving the pilot plant shown below. The original objective has been satisfactorily accomplished, and the trade group members are now negotiating for substantial volumes of additional gas.

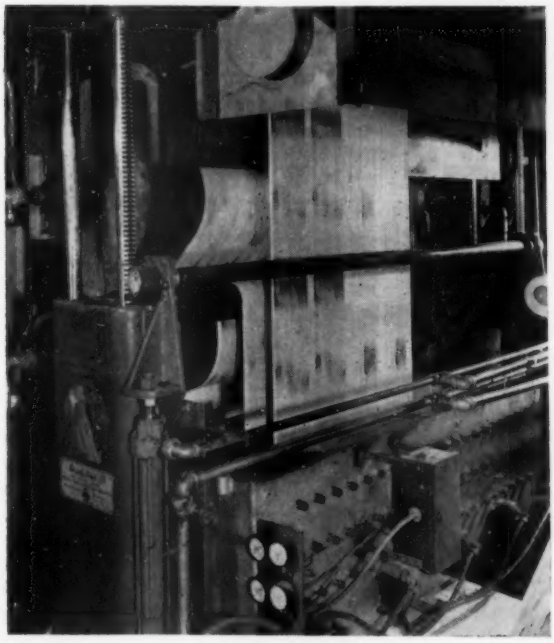




A large steel company was anxious to secure an anneal for continuous steel strip which would simplify preparation for galvanizing and yet secure a zinc coat adherence capable of withstanding severe bend tests. It then proceeded to sponsor a study of new methods on a pilot plant basis. Satisfactory outcome of those earlier investigations has caused that steel plant to contract for hundreds of thousands of dollars worth of additional natural gas. A 48-in. steel strip annealing-galvanizing line based on the pilot line is shown above.

About 20 years ago, a now-popular news magazine was about to be launched. What stood in the way was inability to dry inks on coated paper in less than a few day's time. A major ink producer informed the publishers that he had such an ink but it required forced drying equipment not then available. With encouragement by the publisher, he contracted for development of that heat process. Success crowned both the development and the publisher. Today's version of that high speed gas ink dryer is shown below. The magazine can be seen in almost all homes.

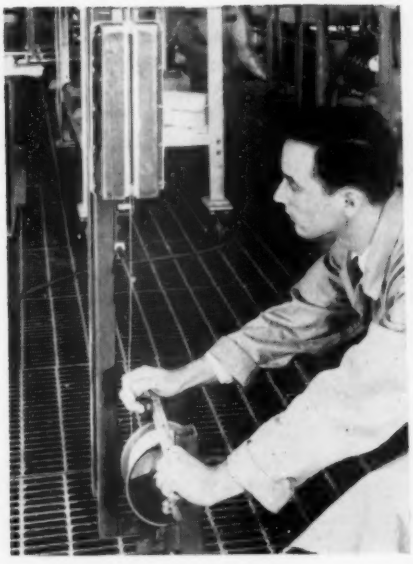




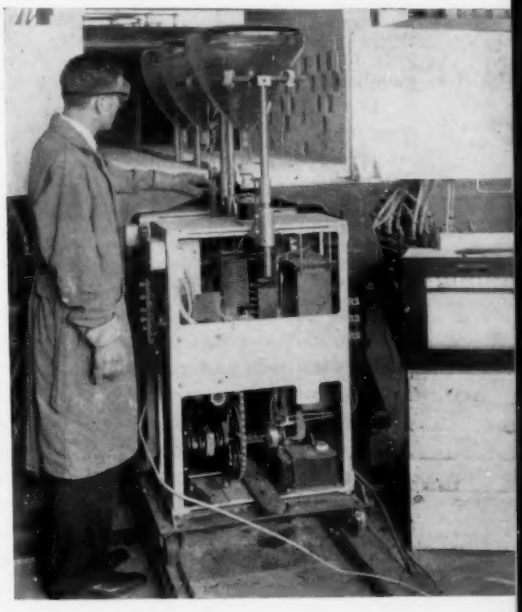
Early in World War II, steatite insulators were required for military purposes, and a famous table china producer was asked to make them. Production techniques and heat requirements differed from those employed in making china, so a competent industrial gas equipment manufacturer was paid for development, consulting and engineering work. The program went under way successfully and in a reasonable length of time. Above is one of the resulting steatite kilns.

User-sponsored processes

A leading producer of TV picture tubes wished to take advantage of faster heating cycles for heat processing those tubes in a final production step. Breakage from thermal shock in improperly designed equipment could be disastrous because of the value of the tubes at that stage. Consequently the tube producer sponsored research and development to study thermal effects on the tubes, and to assure optimum equipment design. A lab test is shown below. Without the assurance of test results, that customer would probably have turned to "safe" electric ovens.



The wire industry has been anxious to heat single and multiple strands for several purposes with equipment sufficiently compact and flexible that it can easily and quickly be retracted. Such an arrangement would make those strands immediately accessible for full-length inspection, or easy threading when required. The photo at left shows one phase of a sponsored lab investigation testing a special high intensity shielded burner for curing wire coatings.



him not only improved their own position, but ultimately that of the industry and their country as well. On such steps forward are based our progress, our scale of living and sometimes our national welfare.

Now why are these remarks being addressed to you? It is, course, expected that better industrial gas engineers will strive to keep themselves acquainted with the latest and best heat processes, and at the same time to keep their customers well informed. Occasionally an alert gasman will conceive and suggest improvement in gas combustion or production methods. Generally, however, the burden of improvements is left to others—a few equipment manufacturers, occasionally the customer, and, of course, the American Gas Association's industrial and commercial research program. But is this enough? Or do we need more sources of new ideas, new equipment, new processes?

Private American industry spends approximately $1 billion per year on research and development, and the federal government still more. Much of this is being spent for improved products or processes which involve heat treatment. What are we doing *during the development stages* to assure that the fuel to be used is gas? The answer, very simply, is "not much"! Certainly it is not enough.

Our industral and commercial research committee spends approximately $75,000 to $100,000 per year on projects recommended by members. Roughly half of these relate to commercial gas applications, and half to industrial. A few projects benefit both jointly. It is unfortunate, perhaps, that many of this committee's projects in the past have apparently been initiated in an effort to meet competitive threats, in what might be called defensive action. This is not in criticism of that committee's work, because its funds and responsibilities are such that it cannot be expected either to have the resources, or to take the initiative for large projects or those distinctly of a pioneering nature. It is to be hoped that the good work of the research committee will go on, with a growing effort.

What about the equipment manufacturers? In recent years these firms have been the principal source of new gas-fired processes. It is hoped and expected that contributions from this source will continue to grow. In most cases we're holding our own against competitive industrial fuels, but not much more than that. So far as the new metals are concerned, however, our competitors are out in front at present.

Now let us turn to the industrial customer. Spending $1 billion annually on research and development, he is obviously a large potential source of development money. He also, we hasten to add, is vitally interested in any development which may benefit him. In fact he is continually seeking the most productive ways to spend those many millions. This huge potential source of funds for improved gas processes has been practically untapped except in isolated instances. Why should this be so?

There seems to exist a belief in the minds of some utility men that the customer should never be asked to pay for development work on gas-fired processes or equipment. To those who maintain that belief, let us point out that some of the finest relationships have existed between industrial gas consumers and agencies whom they paid to develop new processes. Such relationships have not only been mutually profitable, but have usually kept those industrial customers out in front of their competitors. Such practices are the order of the day, entirely reasonable, and potentially advantageous. They are here to stay.

User-sponsored research and development has already resulted in many improved processes which strengthen the demand for industrial gas. Proprietary considerations often cloak such developments with secrecy for a time, but some of them can now be offered as examples, as shown in the accompanying illustrations.

It is hardly possible to estimate the amount of additional gas load sold as a result of these user-paid investigations, and the volume protected against competitive inroads. Nor can we estimate the volume which will be added as a result of currently sponsored projects or those now being negotiated. In what better way can we advance our interests with those of our customers, than for each of us to *think* improved process and to encourage necessary development?

There are a few gas utility engineers already operating on this level. There could be many more. One such man conceived an improved type of gas-fired brass melting furnace a few years ago, and sometime later was offered $25,000 by the crucible manufacturers for further development work.

More recently another industrial gasman visualized the advantages of making a certain batch type heat process continuous, and brought his customer together with a responsible "gas minded" research and development agency. While in this case both batch and continuous processes will have been gas fired, competitive fuels will have been pushed farther out of the picture, and better product quality is expected to increase that customer's business volume. In his campaign for improved gas application, this same engineer has subsequently induced two well-known customers to spend many thousands of dollars developing improved methods of using gas for melting glass and for melting iron, respectively. Both coke and electricity will be displaced.

In the allocation of industry's extensive research funds, heat processes will be as eligible as any others. What is required that our industry may benefit, is for alert gasmen to observe, thoughtfully, and to anticipate the real needs of their customers. Then responsible agencies must be found which are capable of fulfilling those needs. Our competitors do it, and wherever they are successful, we find the gasmen again fighting in defensive territory. Cannot *we* bring *our* customers together with agencies willing and able to develop better heat processes? The answer is that we not only *can*, but we *should*. To do so successfully constitutes the highest level of industrial gas salesmanship. For on that level we are *not* continually jousting with competitive fuels. Then, *we* are the competition, and *we* set the pace. ■

This article is adapted from a talk presented at the AGA industrial and commercial sales conference held in New Orleans, April 17.

Canadian Report

THE GAS INDUSTRY IN CANADA

Canadian gas companies to spend $359.9 million this year

THE impending arrival of natural gas into previously unserved areas has started an unprecedented spending program by Canadian gas companies, GAS' 10th Annual Construction Survey reveals.

Canadian transmission and distribution companies this year will spend $359.9 million to build new facilities and expand existing ones.

And, say Canadian officials, this year will be only the start of a period of phenomenal growth by the gas industry in Canada.

Once the 2287-mile Trans-Canada Pipe Lines Ltd. project is finished, the country's six largest provinces will have abundant supplies of natural gas for the first time. Trans-Canada's line will be completed as far east as Port Arthur this year.

Canada's other major pipeline project, Westcoast Transmission Co. Ltd.'s 650-mile line from the Peace River fields in Alberta to British Columbia, will be in operation this year.

As would be expected, the biggest share of the 1957 spending will be done by the transmission companies. Westcoast has budgeted $151 million for its project; Trans-Canada has ticketed $98 million for this year's work; and the government-owned Northern Ontario Pipe Line Crown Corp. has an appropriation of $50 million to build a 310-mile stretch of big-inch line from the Manitoba-Ontario border to Port Arthur. If pipe and labor are available, the Crown Corp. says it will continue building the line around the north shore of Lake Superior until bad weather shuts the job down next winter.

While the big share of Canadian construction expenditures will be made by transmission companies, many distribution companies will start expanding in a big way during 1957.

Only a handful of companies in the province of Alberta and in parts of Ontario and Saskatchewan have had natural gas in previous years. Soon it will be available in nearly all thickly populated areas in Canada.

Many of these cities have been served by manufactured gas systems; others had no gas service at all.

GAS' survey shows that distribution companies will spend at least $60.9 million in 1957. This estimate is on the conservative side. One major Canadian distribution company, which will convert its system to natural gas this year, has not yet revealed its construction plans. Other companies are still in the early stages of formation, and just don't know what they will spend, and when. ■

1957 CONSTRUCTION BUDGETS OF CANADIAN GAS COMPANIES

Alberta Gas Trunkline Co.	2,985,000
Canadian Western Natural Gas Co. Ltd. Edmonton, Alta.	3,000,000
Consumers' Gas Co. of Toronto	4,000,000
Dominion Natural Gas Co. Ltd. Brantford, Ont.	2,500,000
Inland Natural Gas Co. Ltd. Vancouver, B. C.	25,000,000
Northern Ontario Natural Gas Co. Ltd. Toronto, Ont.	1,000,000
Northern Ontario Pipe Line Crown Corp. Toronto, Ont.	50,000,000
Northland Utilities Ltd. Edmonton, Alta.	750,000
Northwestern Utilities Ltd. Edmonton, Alta.	3,000,000
Quebec Natural Gas Corp. Montreal, Que.	5,000,000
Saskatchewan Power Corp. Regina, Sask.	5,865,000
Trans-Canada Pipe Lines Ltd. Toronto, Ont.	98,000,000
Westcoast Transmission Co. Ltd. Vancouver, B. C.	151,000,000

An overall view of the production line at the Philadelphia Gas Works meter shop.

How Philadelphia Gas Works detects defective meters

By **ROBERT J. OTT, Superintendent, Meter Division**
Philadelphia (Pa.) Gas Works

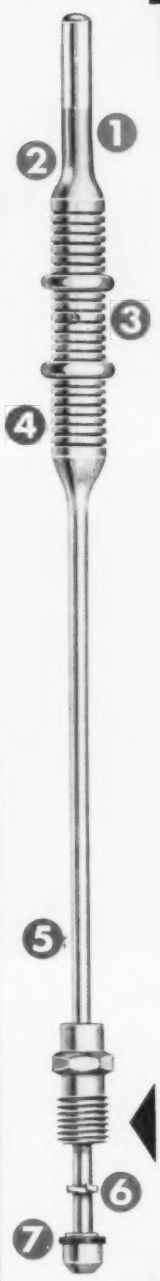
PGW's system of meter check and repair has greatly reduced the number of meter failures on customers' premises. Twenty-five years ago the company instituted its check and repair system. Though many improvements have been made, the same basic plan is still used. And it is continuing to save PGW time and money. Here is how it operates . . .

PHILADELPHIA GAS WORKS has developed a system of meter check and repair which is paying dividends in reduction of trouble on customers' premises. Our program has reduced meter failures drastically.

The overall program is not unlike that of other companies. We have set up a production line with about 70 employees who check, adjust and repair approximately 62,000 meters a year. The PGW meter shop is, in general, like those of other large companies,

GAS exclusive

NEW SUPER-CLAD THERMOCOUPLE



GENERATES GREATER VOLTAGE OUTPUT!

- *Interchangeable on all standard pilots*
- *Costs no more*

The *new* Grayson Super-Clad couple generates greater electrical output than standard thermocouples to eliminate service calls caused by needless outages... insures trouble-free, positive holding power... fails-safe only when the pilot goes out! And yet, Grayson's *new* Super-Clad couple costs no more than ordinary, standard thermocouples! Compare the advantages of the *new* Super-Clad—write today for a free sample.

EXTRA LENGTH NUT MAKES INSTALLATION EASIER... QUICKER!

FOR FREE SAMPLE...
WRITE TODAY (DEPT. 5D)

1. **SUPER-CLAD COATING**
(Nickel-Zinc) "all over" plating protects copper from heat, prevents oxidation for more positive operation.

2. **IMPROVED THERMO-ELECTRIC ALLOYS**
in the heart of the thermocouple for greater electric output, more positive operation.

3. **TWENTY-FOUR COOLING FINS**
create a greater temperature differential for efficient, more positive operation.

4. **EXTENDED COLD JUNCTION**
greater voltage output than standard thermocouples for more positive operation.

5. **TIN PLATING ON CONTACT END**
for better electrical conduction...prevents oxidation for more positive operation.

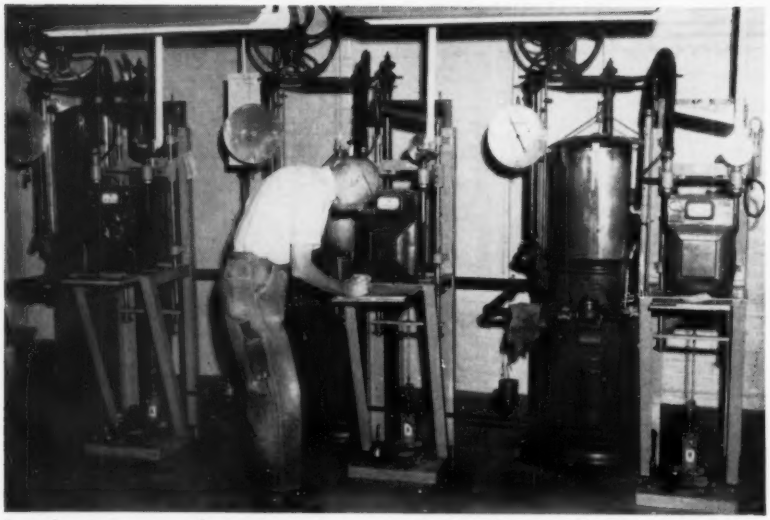
6. **LOCK WASHER**
maintains tight fit for positive operation.

7. **NON-SHRINKING INSULATOR**
insures a tight fit, reduces "cold day" outages caused by changes in ambient temperatures.

Mr. Controls

Robertshaw-Fulton
CONTROLS COMPANY

GRAYSON CONTROLS DIVISION
Long Beach, California



Incoming tests are made on automatic provers. Test results are used to obtain a picture of accuracy and vintages of PGW meters.

Defective meters go to opening machines. One machine removes tops and back plates, the other fronts and backs on production-line basis.

Veteran employee Bill Fleming examines each meter removed for defects and marks tag. He is in complete charge of this phase of repair.

with regard to equipment and repair practice. This is so because metermen have been eager to exchange information and adopt each other's good ideas. For example, our opening machines were first brought out by Consolidated Edison of New York. Some of our proving equipment originated at Public Service of New Jersey. On the other hand, we gave the "slow motion test" and the dry cleaning machine to the industry.

Our meter maintenance program is unique, however, in the handling of meters that develop some sort of defect while in service on customers' premises. Such defective meters are removed and a tag is attached showing among other data the reason for removal.

The defects are listed below with the number of cases occurring in the last year:

Leak	1463
Noisy	943
Won't pass gas	393
Gradual cease	209
Works catch	124
Cease to record	61
Miscellaneous	5
TOTAL	3198

These 3198 defective meters came from a total of approximately 600,000 connected meters, which is a remarkably good record. It is equivalent, on the average, to one defect per meter in 187 years of service. What other mechanical device can claim such good performance?

The foregoing self-satisfied attitude should, however, be avoided. A much better approach is the realization that during the year, 3198 contacts were made with customers that were unfavorable to the gas company and that the defects cost the gas company considerable money in making visits to the customer's premises, changing the meters and repairing them.

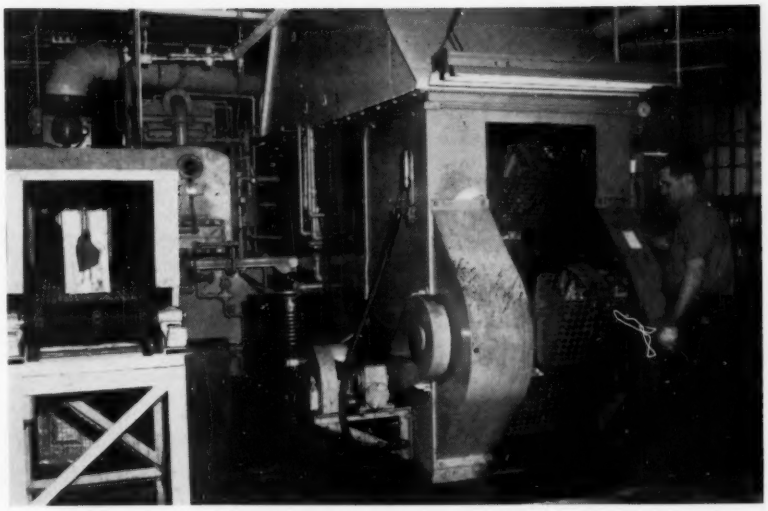
PGW instituted a procedure in 1932 which is based on the careful, unhurried and complete examination of every meter removed for defect. In the early days, when there were many more defects from about three quarters of the present number of

connected meters, a group of our best mechanics made the examinations and described the nature of the defects on the test tags. Now the work is in the hands of only one man, Bill Fleming, who has 37 years of meter experience.

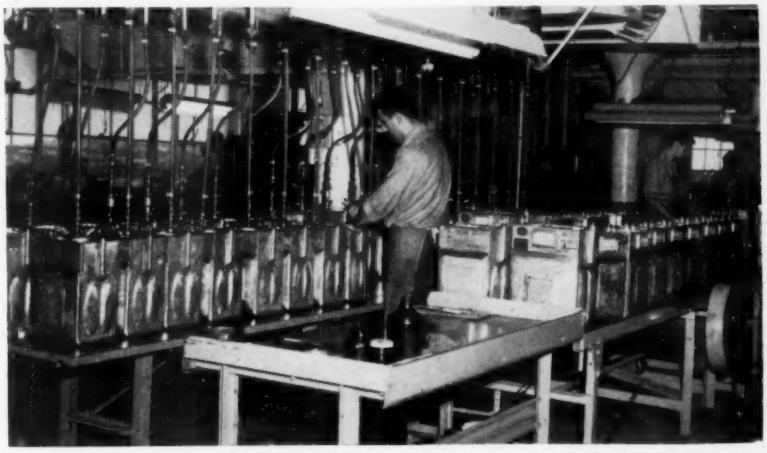
The data gathered by means of the examinations are tabulated and analyzed. Over the years, many beneficial changes have been made in meter design and construction by effort to eliminate the troubles shown by the data. One of the first and most important improvements was the soldered dial glass which eliminated about nine-tenths of meter leaks. It replaced the puttied glass, which was very susceptible to leakage, with a strong and reliable assembly. Much more important, however, was the fact that by means of the soldered glass, a tinplate meter was, for the first time, made capable of withstanding sufficient internal pressure to allow it to be given a good test for tightness before it left the shop to be set on the customer's premises.

Another important improvement was the development of a valve guide which reduced noise from the rubbing of wire against guide. Another was the smooth sliding valve which eliminated valve "lift" as the valve cover moves across the seat. When it occurs on the customer's premises, valve lift or chatter can cause noise objectionable to the customer and can cause loss of registration. Valve lift or chatter is rarely continuous. It occurs typically for a varying length of time on some occasions when the customer's load is near a maximum; for example, when the house heater is working.

The program to reduce meter defects — to make an excellent record even better—has had the support of the principal meter manufacturer with whom we deal. Close cooperation has given the benefit of improvements not only to PGW, but also to the entire industry. No doubt, meter sales were increased thereby because of the powerful incentive to replace an old meter with a new one if the new one will give much better performance. ■



Dry cleaning machine, designed at PGW, cleans meter internally with solvent of trichlorethylene. At left is drying conveyor.



For slow-motion test, meters are run with air at inlet pressure of 0.5-in. wc and a rate flow of 0.5 cfh. All meters must pass this test.

Final proving test is made on automatic provers, which enable operators to handle meters with both speed and accuracy.

One of the models available is this 14-ft straight-wall type.

Package kitchens feature all-gas equipment

BECAUSE a Lone Star Gas Co. serviceman became a salesman one morning, an all-gas kitchen package program was launched.

The serviceman started out his day as a serviceman, adjusting a gas oven in a Fort Worth home. He didn't know, of course, that the call was to the home of a man who was, and had been for some time, meeting with leaders in the building industry seeking something new for kitchens. He didn't know either that one of the officials of his own company, R. L. Stephenson, general coordinator of sales, was one of the most active advisors on the new kitchen project.

The serviceman became all salesman when he saw that the lady of the house needed a gas dryer to go along with her washing machine. Impressed with his telling of the virtues of the automatic gas dryer, she had one installed "on trial."

The beginning of the Mayfair all-gas kitchen was in that kitchen when the husband came home and saw the dryer. With the sale of the gas dryer by the serviceman providing the inspiration, an intensified study of the gas kitchen industry was started.

With an eye toward providing the package at popular prices, the Texas kitchen planners and their associates took inventory of what they had available for the package. They found they had warm wood cabinets, sinks and fittings, range hoods, inter-com systems and the cabinets for making built-ins out of free-standing Servel refrigerators.

To complete the package, the following appliances were included: disposer units, dishwashers, automatic clothes washers, automatic gas dryers, gas incinerators, and gas water heaters. This comprised to the planners a perfect package—one that can be purchased as a complete package or as individual components.

A complete range of Mayfair modular unit cabinets is offered.

Mayfair kitchens are manufactured by the Mayfair Cabinet Corp. of Fort Worth and by affiliate companies elsewhere.

The all-gas kitchens will be distributed only through franchised gas utilities. Gas utilities—both merchandising and non-merchandising — holding area franchises on Mayfair Kitchens may sell direct or appoint distributors and dealers to handle the kitchens under their supervision.

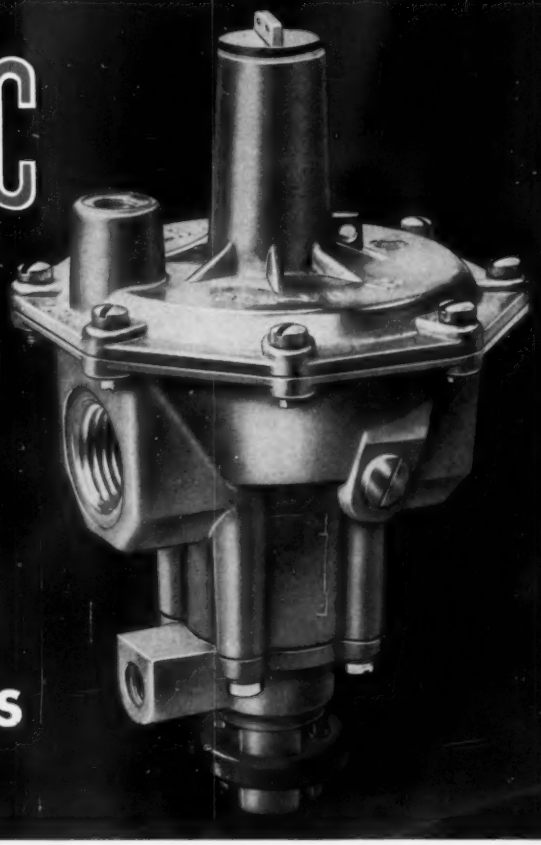
Utilities not wishing to compete with retail dealers and actively merchandise the kitchens at the retail level, may appoint appliance and kitchen dealers to handle retail distribution under the gas utility area franchise. If this option is selected it places the utility in a favorable position of cooperating with retail dealers to the extent of awarding dealerships—without inventory—backed by combined integrated national and local promotion program of Mayfair Kitchens and gas appliances.

All orders from appointed distributors and dealers must be placed through the utilities, but deliveries will be made direct to dealers or installers if desired. This distribution plan is designed to prevent locally appointed distributors "foot-balling" these kitchens to sell other products, and to insure that they are sold only as "New Freedom Gas Kitchens" without substituting competitive electric appliances.

Appliances used in the Mayfair all-gas kitchen will consist of a line of free-standing and built-in ranges and ovens, disposal units, dishwashers, automatic washers and gas dryers, intercom systems with master kitchen units, counter-top built-in food mixing units, and gas incinerators. Servel gas refrigerators will be used. Only those appliances whose manufacturers agree to jointly promote these all-gas kitchens will be chosen as standard equipment. This gives a combined industry-wide promotion program for consumer advertising and promotion.

In the Southwest, Lone Star Gas was the first to join the all-gas kitchen program. Southern Union Gas Co. followed suit quickly. Joining in the program is part of Southern Union's expanding business development program for its far-flung system. ■

THERMAC



Finest
GAS CONTROLS

What the name THERMAC on a gas control means to you . . .

Undivided attention to the specialty of producing gas controls has resulted in a number of basic and substantial design features around which our present products are built.

Concentration too, in manufacturing and production methods is also vitally important. In our own modern plant we do the entire job from Engineering and Research to Assembly and Final Testing — no one else is entrusted with this responsibility. Therefore, the controls you buy today are the result of 24 years of highly concentrated effort in research and in manufacturing techniques. Our volume production methods are your assurance of low cost.

Sound engineering, expert manufacturing, low cost and prompt delivery — that's what the name Thermac means to American Appliance Builders.

SEND FOR ILLUSTRATED CATALOG

24 YEARS' EXPERIENCE BUILDING GAS CONTROLS

THERMAC

Service is our job — on the spot engineering assistance and immediate delivery.

HM **COMPANY** 800 East 108th Street • Los Angeles 59, California

GAS news

Atlanta Gas selling South Carolina systems

Two out-of-state properties of Atlanta (Ga.) Gas Light Co. will be sold to South Carolina Electric & Gas Co. The two systems, at Aiken and North Augusta, S. C., are the only ones owned and operated by Atlanta Gas outside of the state of Georgia.

The sale is subject to approval of both the South Carolina Public Service Commission and the Federal Power Commission.

Man-made environment effects to be studied

The first conference on how artificial, man-made environment affects the public's health and comfort will be held in Los Angeles in September.

A top level committee—manufacturers, suppliers, contractors and utilities in the heating and air conditioning field—has been named by the Institute of Heating and Air Conditioning Industries to map the plans for the conference. The discussions are tentatively titled "The Institute on Environmental Control and the Public's Health and Comfort." They will be held on the campus of the University of California at Los Angeles. Sponsors are the UCLA School of Engineering and IHACI.

Leo Hungerford is the general chairman. Advisers are Dr. Harold P. Hayes, dean of engineering at California State Polytechnic College, and Joseph J. Alvin, president of the institute's PR firm, Joe Alvin & Co. Mr. Hungerford is past president of both IHACI and the southern California chapter of the American Society of Heating and Air Conditioning Engineers.

The conference is part of an industry-wide public education and information program through a so-called stamp-plan program. Under this plan, funds are raised through $1 revenue stamps affixed by the manufacturers to every central furnace and 50-cent stamps to each floor and wall heater.

N. C. Natural will serve 30 communities

North Carolina Natural Gas Corp., which plans to bring gas to 30 eastern North Carolina communities, is setting up headquarters in Fayetteville. Construction of lines to serve the towns is expected to begin within the next three or four months.

P. McDonald Biddison, president of the company, said gas service will probably be available by January 1958. Transcontinental Gas Pipe Line Corp.'s system will be tapped near Mooresville. Some 700 miles of line will be operated by North Carolina Natural, which will also construct distribution plants under franchise in 20 cities and towns on the system. A maximum of about 40 MMcf/day will be distributed by the company.

B. H. Kyle, vice president, will direct the operations of the company from its headquarters in Fayetteville.

Committee planning the first conference on environment control met recently in Los Angeles. Present were (seated from left) Sam Houston, assistant to Dean L. M. K. Boelter; Ed O'Callahan, IHACI education chairman; Robert M. Johnson, past IHACI president; Albert F. Bush, smog authority; Dr. Craig Taylor biophysicist; and Sam Jaffe, publisher of *Building News*. Standing: Jack Dillon, assistant to Dean Boelter; Assoc. Prof. Harry Buchberg; Joseph J. Alvin, IHACI PR director; and William L. Hoyt Jr., IHACI standards chairman.

Research site bought by John Wood Co.

Continuing its new expansion program, John Wood Co. has purchased a 16-acre tract of land in Florham Park, N. J., for its engineering and research division.

In making the announcement, Guy George Gabrielson, chairman of the board, said that the new site will be available for other purposes by the company. No date has been set for construction of the new research and engineering facilities. However, preliminary approval has been secured for the project from the Florham Park planning board.

John Wood's planned growth program has put the company into two new markets in the past year. In May 1956 the Fluid Heat line of heating and air conditioning equipment was acquired. This was followed in August by the purchase of the Haverly Electric Co., which makes farm refrigeration equipment.

Northern Illinois added record 37,511 customers

Northern Illinois Gas Co., Bellwood, Ill., added 37,511 new customers to its system in 1956, a record-breaking figure. This means that Northern Illinois connected a new customer at the rate of about one every 3½ minutes of every working day during 1956.

In his annual report to stockholders, President Marvin Chandler said that the 562,880 customers served at the end of 1956 represent an increase of 75 per cent during the past 10 years. This growth is reflected in the utility's total gas revenues that approximated $80 million—a new high—in 1956.

Despite the accomplishments of

1956, Mr. Chandler said his company still faces many problems. "Of these, the most challenging is our gas supply situation. . . . Until further progress permits additional space heating sales, it is probable that, given normal weather, we will be on something of an earnings plateau, and will not experience substantial annual increases."

Mr. Chandler is optimistic about the continuing growth in the company's 20-acre territory. He reported plans to spend some $75 million on construction during the 1957-60 period, including about $21 million this year.

New operating and commercial headquarters at Glenview and Joliet and new operating reporting centers in Bloomington, Mendota, Morris, and Streator are included in the construction program. A new meter shop is under construction at LaGrange, and land has been acquired for a headquarters building in Crystal Lake.

Approvals lab set up at U. of British Columbia

The provincial department of public works in Vancouver, B. C., has made a grant for a new gas approvals laboratory in Vancouver. The lab will be located in the new wing of the B. C. Research Council building on the University of British Columbia campus.

Testing is being carried out under the supervision of John E. Breeze, head of the physics division of the council.

Measurement short course set for West Virginia

Initial plans have been completed for the 17th annual Appalachian gas measurement short course at West Virginia University in Morgantown on Aug. 26-28.

Subjects to be covered in the intensive three-day course include fundamentals of gas measurement. In addition, special sessions will be offered on domestic meters, orifice meters, large capacity meters, automatic control instruments, pressure regulators and other related equipment.

Close to 100 industrial and technical experts will conduct the various classes, lab sessions and forums. H. B. McNichols, Columbia Gas System Service Corp., is general chairman and James W.

For big jobs.. little jobs.. *scattered jobs*

Whatever your work schedule may call for, from mainline extensions and pipe reclamation to small scattered service connections, Parsons utility-size 88 Trenchmobile has plenty of production capacity to fill the bill. This fast working trencher digs up to 14½ feet of trench per min., 8 to 16 inches wide and at depths to 5 feet. Its self-sharpening "Tap-In" teeth assure maximum digging efficiency at every depth, width, in all materials. Hinged crumber sweeps trench bottom clean, ready for pipe.

Service connections

On house-to-street service connections Trenchmobile undercuts walks, curbs, cross-pipes, saves you costly hand clean-up. It also makes vertical set-ins, flush with foundations. Hinged crumber swings up, out of the way — positive down-crowd boom starts cut fast, holds accurate grade. With shiftable, reversible spoil conveyer you work close to trees, hedges, poles, fences and other side obstructions. Add 6-foot blade (optional), and Trenchmobile backfills its own trench — does entire job with one-man, one-machine economy.

Drives anywhere

Mobility on rubber steps up work schedules on widely scattered jobs. Trenchmobile drives over streets and highways at 12.6 mph. There's no waiting for trailer — no loading or unloading delays.

How about a Trenchmobile demonstration on your work? Parsons distributor will gladly arrange it. See him, or write us. (Also check Parsons big crawler Trenchliners®.)

mail to: **PARSONS Company, NEWTON, IOWA** *(Division of Koehring Co.)*

Send us latest bulletin on rubber-tired 88 Trenchmobile®.

NAME_____ TITLE_____

COMPANY_____ DIV_____

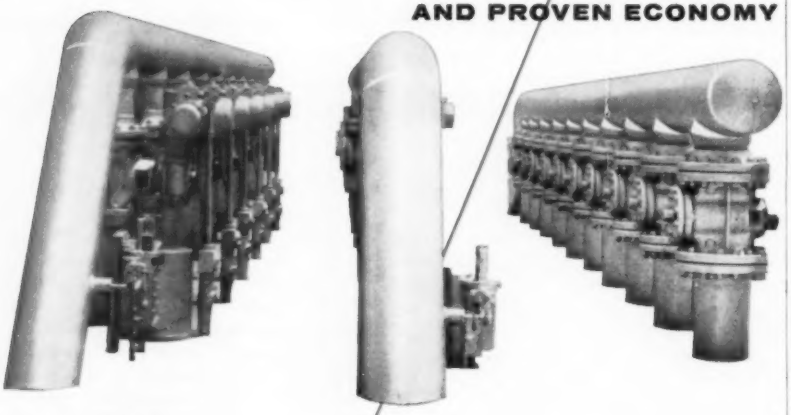
STREET_____

CITY_____ STATE_____ P792 GAS

BRANCH
after
BRANCH
after
BRANCH
after
BRANCH
after
BRANCH

WELDOLETS

FOR ASSURED STRENGTH
AND PROVEN ECONOMY



WELDOLETS

THREDOLETS

SOCKOLETS

Are you effecting this economy for your company? Neat and uniform appearance is evident in code constructed weldolet headers in this crude oil pipeline terminal. The money saved is in the bank and does not appear in this picture. If you are not using the weldolet method of cutting piping costs, write today for information.

Sold Through Leading Distributors

BONNEY

PENNSYLVANIA DIVISION
BONNEY FORGE & TOOL WORKS
ALLENTOWN, PA. DEPT. B

Chrisman, East Ohio Gas Co., is program chairman. R. E. Hanna and R. W. Laird, of the West Virginia University faculty, are in charge of publications, registration, exhibits and housing.

New rate-making method under study in Ohio

A bill to revise the state's utility rate-making procedure has been introduced in the Ohio legislature. Sponsored by Sen. Andrew C. Putka, the bill has the backing of the Ohio Municipal League.

The measure would eliminate the "reproduction cost new, less depreciation" system as the sole method of determining rate bases and would substitute a "reasonably sufficient return" theory.

Similar proposals have failed at past sessions of the Ohio Legislature.

SoCounties opens new operations base

A $260,000 operations base has been activated by Southern California Gas Co. in Downey, Calif.

According to Paul Walters of the company, the new base will become a part of SoCal's recently announced southeast division, which will be activated later this year. It will serve residents in nine communities.

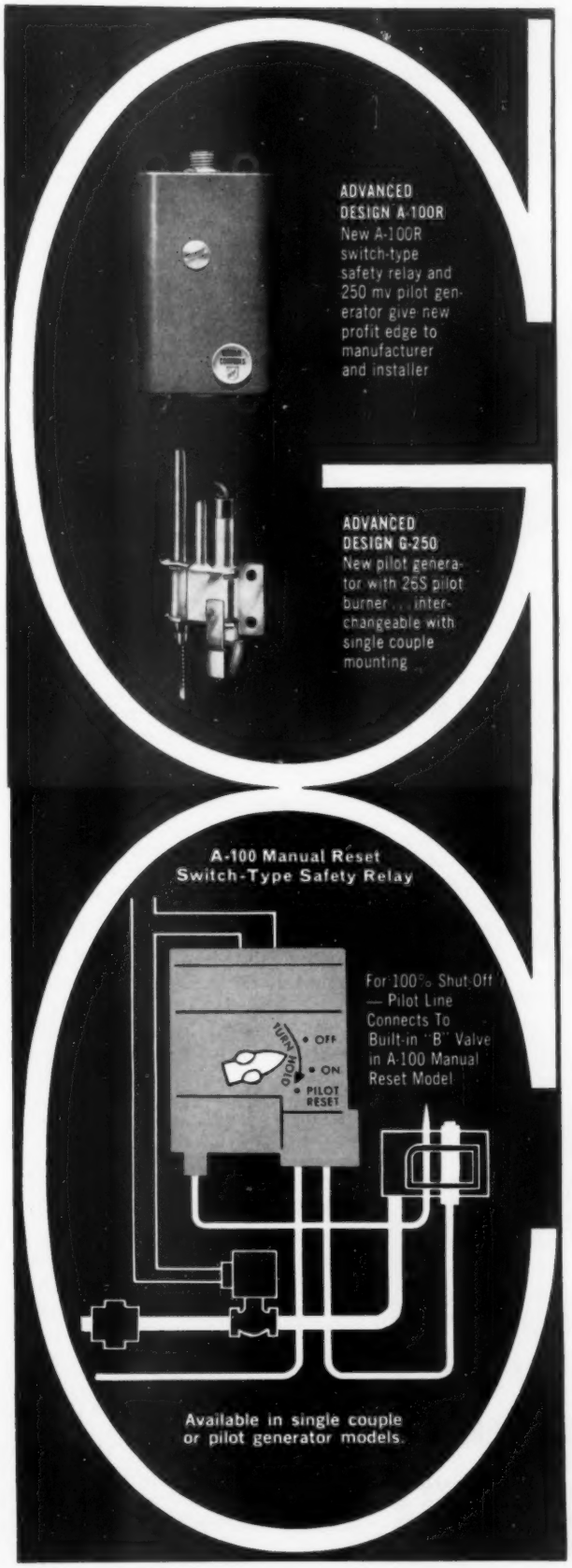
The new operating unit, under A. W. Wilson, division manager, will not be completely active until a headquarters building is built in Downey, about a half a mile from the new base.

Southeast division will start its existence with approximately 110,000 customers. The area has seen large-scale residential development as well as industrial and commercial expansion since 1940. Most of the growth occurred in the last five years.

IGT planning four summer sessions

This year's summer session at IGT has been planned to benefit gas engineers, cadet engineers and engineering students. Fundamentals of the four major areas of operation will again be given in four separate three-week courses.

Natural gas production and


ADVANCED DESIGN A-100R
New A-100R switch-type safety relay and 250 mv pilot generator give new profit edge to manufacturer and installer
ADVANCED DESIGN G-250
New pilot generator with 26S pilot burner . . . interchangeable with single couple mounting
A-100 Manual Reset Switch-Type Safety Relay
For 100% Shut-Off — Pilot Line Connects To Built-in "B" Valve in A-100 Manual Reset Model
TURN HOLD
OFF
ON
PILOT RESET
Available in single couple or pilot generator models.

INSTALLERS! MANUFACTURERS!

Profit from new advanced design switch type safeties

Installing or Servicing Gas Furnaces? Make big savings with General Controls' new A-100R Safety Relay *with automatic reset!* First, you'll eliminate a lot of unnecessary service calls on false safety shut-downs. Second, you'll find extra *folding-money profits* in replacing old fashioned electric safeties with the low cost A-100R. Ask your wholesale supplier for this profitable General Controls A-100R—G-250 "safety package" today!

OEM's Benefit Too! There's a wonderful *system simplicity* for original equipment manufacturers when they use the A-100 Series switch-type safeties. Eliminated are the double and triple inventories and pressure-drop problems of mechanical safeties. Labor is less. Material is less. And...when you use the G-250 Generator—26S Pilot Burner combination, you lower costs even more!

And Yet Another Advantage: In the Manual Reset version of the A-100, there's a *brand new* feature...100% safety shut-off. A *built-in* "B" Valve is available right in the safety relay!

SEE THE A-100 SERIES NOW! Whether you are servicing or manufacturing...see your wholesaler or call in your nearby General Controls Factory Representative.

America's Finest Automatic Controls for Home, Industry and the Military

GENERAL CONTROLS

Factory branch offices serving *all* principal cities of the United States and Canada.

Five Plants: Glendale, California • Burbank, California • Iron Mountain, Michigan • Skokie, Illinois • Guelph, Canada •

processing is slated for June 10-June 28, natural gas transmission for July 8-July 26, natural gas distribution for June 10-June 28, and natural gas fuel utilization for July 8-July 26.

Each course consists of a series of lectures, discussions, quizzes, seminars, and calculation and study periods.

Summer school classes are held in a new IGT building in Technology Center in Chicago. The building, its equipment, and pilot plant facilities represent an investment by the gas industry of more than $1.5 million for education and research.

Cost-of-relocation bills introduced in 26 states

Wyoming's Governor Simpson has vetoed a legislative bill which would have required the state highway department to pay for relocation of utility facilities when affected by highway construction projects.

A few days after the Wyoming veto, Utah's Governor Clyde signed into law a bill permitting the state to share the cost of relocation.

Bills calling for reimbursement to utilities for relocation costs or to broaden existing legislation have been introduced in 26 states this year. In 20 states the bills would provide reimbursement for relocation on all federal-aid systems. In five it would be limited to the interstate system. In addition to Utah, where legislation has passed both houses, legislation has passed one house in five other states.

Western research center planned by Robertshaw

Construction will begin soon on a $250,000 western research center, according to T. T. Arden, executive vice president of Robertshaw-Fulton Controls Co. The center will be located on a five-acre site in Anaheim, Calif.

Basic and applied research will be conducted in the fields of automatic controls for air conditioning, home heating, domestic and commercial water-heating, cooling, food preservation and home laundering appliances.

In 1954 Robertshaw opened a $1 million research center at Irwin, Pa., devoted to research in automatic controls for home and industry. According to Mr. Arden, the new center will engage in the same fields of interest, but with emphasis on the western point of view.

The present research facility near the Los Angeles International airport will be merged with the Anaheim center when construction is completed.

Oklahoma bill bans wholesaling by utilities

A bill passed by Oklahoma's House of Representatives prohibits its utilities from selling articles to employees at wholesale prices.

The Oklahoma Retail Merchants Association sponsored the bill. The measure had been amended in committee to permit utilities to advertise and display appliances. It also would prohibit a person from advertising merchandise at wholesale prices "unless he is actually selling at wholesale prices."

Flame Retention
RING GAS BURNER

Through a *new* application of an old basic principle WEBSTER now offers unequalled stability in an non-premixing ring gas burner.

Presently packaged as Series H, Forced Draft for Gas, Rotary Oil or Combination this revolutionary development will soon be available in other variations.

Some Territories Open

Write for Series B13 literature.

The WEBSTER ENGINEERING *Company*

TULSA 16, OKLAHOMA

Division of SURFACE COMBUSTION CORPORATION, Toledo, Ohio

Rep. J. D. McCarty, principal author of the bill, said that public service companies and other large firms have been purchasing thousands of dollars worth of merchandise for resale to employees at wholesale prices. He asserted that the practice is "striking at the very foundation of retail business."

A bill introduced in the Vermont Senate would prohibit public utilities from engaging in the retail sale of appliances and other merchandise.

Laclede's storage program upheld by Supreme Court

The U. S. Supreme Court has upheld the right of Laclede Gas Co., St. Louis, to store natural gas in a 6000-acre underground tract.

A brief order denied an application by Collins Bros. Oil Co. of Mt. Vernon, Ill., for a writ of certiorari and upheld the court of appeals 1956 decision dismissing the Collins suit to halt Laclede's use of the storage facilities.

Still pending before the Supreme Court is an appeal by Collins from a Missouri high court ruling which upheld Laclede in a similar suit. Also on the calendar in the St. Louis county circuit court is a new suit (see April GAS) brought by residents of the area.

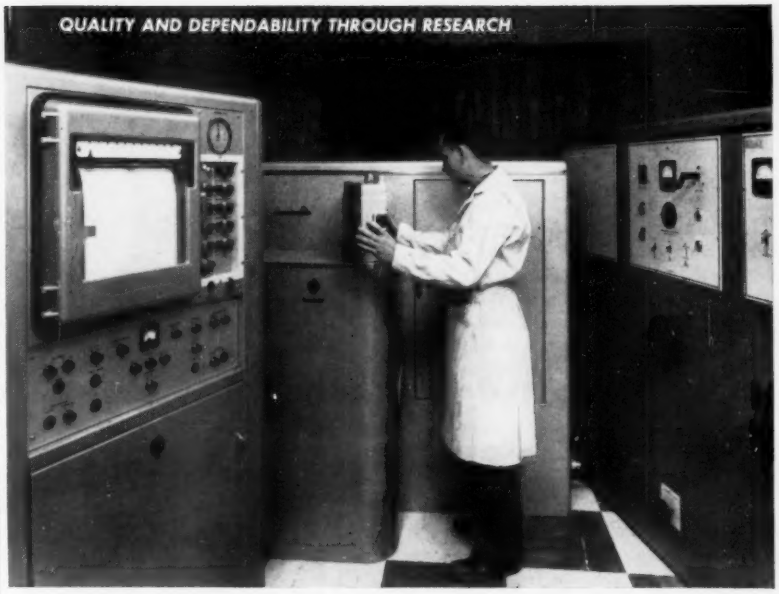
Rockwell expands valve research program

An expanded program of valve research and development has been announced by Rockwell Manufacturing Co.'s meter and valve division.

According to L. A. Dixon, Jr., the enlarged program will include work on automatic lubricators; hydraulic, pneumatic and electric valve operators; coated and high pressure valves; valves for vacuum service; improvement of test methods; and practical methods of producing vacuum-processed metals.

The program will be augmented by a new valve laboratory and machine shop at Rockwell's central engineering headquarters in Pittsburgh. The new laboratory, double the original area, has been equipped for extended prototype proving. Russell L. Sylvester, chief engineer for valve products, heads the new program.

QUALITY AND DEPENDABILITY THROUGH RESEARCH



This Quantometer at Standard Magnesium means

POSITIVE QUALITY CONTROL

At the Tulsa plant of Standard Magnesium Corp., this Quantometer analyzes magnesium faster—and to a greater degree of accuracy (within .0001%) than any other method.

What does this mean? . . . First, because of its great accuracy, it assures consistent high quality. This means material to your exact specifications because a sample of every melt is analyzed before pouring.

Secondly, it gives a printed analysis in a matter of seconds from samples speedily delivered from the mill to the lab through pneumatic tube systems. Other metal analyzing methods rely on a time consuming, error-liable human analysis of results.

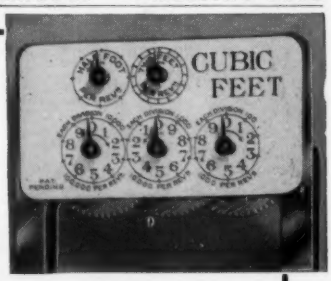
This *positive quality control* is but another reason why Standard Magnesium Corp. leads in *quality and dependability.*

QUALITY AND DEPENDABILITY THROUGH RESEARCH

Standard Magnesium Corporation
TULSA, OKLAHOMA

MAGNESIUM INGOT • MAGNESIUM ANODES • MELTING FLUX

GAS METER INDEXES
AND
METER PARTS
ORIFICES and TOOLS



Serving the Industry for over 30 Years
Inquiries Invited On Replacement Indexes
E. F. GRIFFITHS CO.
346 E. WALNUT LANE, PHILADELPHIA 44, PENNA.

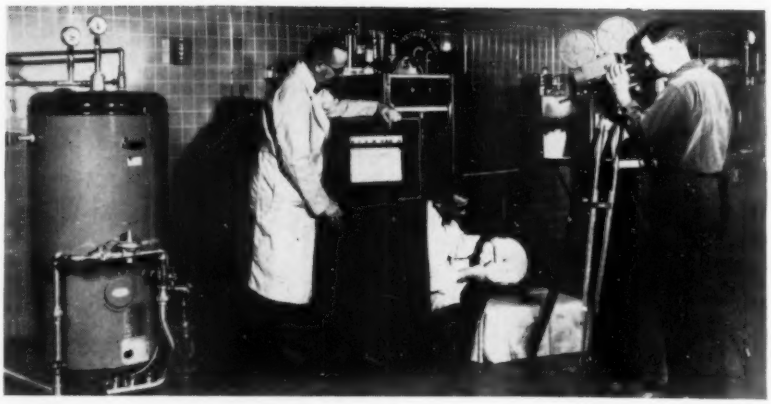
AGA releases dishwashing film

"How Clean Is Clean?" is the title of a new film available from the American Gas Association. The film should be of interest to hotel and restaurant groups, public health officials, sanitation engineers, and equipment dealers in the volume feeding field.

Sponsors of the film are the National Sanitation Foundation and the Conference of Municipal Health Engineers. It shows and explains the proper techniques to be followed in dishwashing procedures to obtain the maximum in both cleanliness and sanitation.

In order to demonstrate proper procedures, a laboratory setting was built patterned after standard kitchen installations in all respects except for the addition of scientific instruments. The instruments are used to graphically show and record what takes place during various dishwashing cycles.

Among supporters of the film, in addition to the AGA, are A. O. Smith Corp. and Ruud Manufacturing Co.



Water temperatures and pressures are indicated on these instruments to show what is actually going on during the dishwashing, rinsing and sanitation cycles in the motion picture, "How Clean Is Clean?"

ARCCO
NOW SPECIFIC GRAVITY RECORDING OF LIQUIDS AT ANY DISTANCE
RECORDING TRANSMITTER
Accurate long-distance transmission of specific gravity recordings is no longer a problem with the new Arcco-Anubis Metameter Recording and Transmitting Liquid Gravitometer. This instrument combines the mechanism of the standard Arcco Liquid Gravitometer with a meta-meter telemeter transmission system which records and transmits the specific gravity record to control room or other remote location. The interconnecting line may be any two-wire electrical circuit or its equivalent: private wires, telephone circuits, carrier current channels, or radio (VHF or UHF).
The range of the standard instrument is .15 or larger, but instruments with ranges of .10 or .05 can be supplied. Specific gravity charts are available for many gravity ranges, and special degree A.P.I. charts can be furnished at slight additional cost. Request Bulletin No. 111-R2B for complete details.
RECORDING RECEIVER
AMERICAN RECORDING CHART CO.
3113 E. 11th St. • Los Angeles 23, Calif.
SEND FOR BULLETIN No. 111R2B

GAS news notes

Dresser Industries, Inc., has acquired Hermetic Seal Transformer Co., Inc., Garland, Texas. Hermetic will become a division of Southwestern Industrial Electronics, another of the Dresser Industries. The newly acquired company manufactures electronic equipment such as transformers and reactors used in equipment for communications, radar, sonar, computers and control systems.

The 1956 net income of Lone Star Gas Co., Dallas, and its subsidiary, Lone Star Producing Co., amounted to a record $14,111,151. According to the annual report, the net income for the year exceeded the 1955 figure by $1,428,476, even though expenses increased in every classification.

Growth continued to be the dominant factor in the Long Island Lighting Co. situation in 1956, according to the company's annual report. In the gas department, nearly every record set in 1955 was exceeded in 1956. Total send-out for the year, expressed in 1000-Btu equivalent, was 10,680,000 Mcf, up 13 per cent over 1955 when 9468 MMcf was sent out.

"Push-button selling for a push-button era" is the theme of a new marketing campaign initiated by John Wood Co.'s Heater & Tank division. All aspects of advertising, sales promotion and merchandising are covered. The plan has been tailor-made to fit the needs of the firm's wholesalers, plumbers, and dealers as determined by the findings of a recent survey.

The electrical mechanical division of Good-All Electric Manufacturing Co. has the largest single civilian contract for cathodic protection rectifiers, according to a recent announcement. Sixty-eight rectifiers of two types were in the contract placed by Esso Standard Oil Co. of New Jersey. The order will be exported to Venezuela for use on oil and gas pipelines there.

Milwaukee Gas Specialty Co. has changed its name to Baso Inc. The new name comes from the company's well-known trademark. This trademark, Baso, was established in the 1930's to identify the first thermoelectric-actuated ignition systems for domestic appliances.

The Arkansas legislature passed a bill giving utilities authority to condemn certain lands for underground storage of natural gas.

Administrative and sales activities of Holly Manufacturing Co. and General Water Heater Corp. have been combined into a new division. Known as the Holly-General Co., the division will headquarter in Pasadena, Calif. Both companies will continue manufacturing at their present locations.

Southern California's chapter of the American Public Works Association has elected C. C. Westmoreland, supervising engineer of Southern California Gas Co., to serve as secretary-treasurer.

A new organization, Calkin & Bayley Inc., New York, has been

IF YOU THINK ALL

First Aid Kits are alike, we've got news for you! To produce a First Aid Kit that would serve you better, we "put the finger" on every place where modern design, latest Quality Control, color keying, and improved manufacturing techniques would bring you important *extras* in First Aid Kit quality and performance.

Then we MADE these improvements. Many of the changes are small in themselves, but they add up to a big difference. Let us prove to you that we have something different . . . something you don't want to miss!

FIRST AID KITS ARE

often a major factor in emergencies. Freshness, purity, and sterility of every treatment contained in Unit "D" packages is covered by our quality control program which assures pharmaceutical thoroughness, unit responsibility.

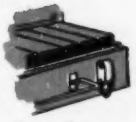
And our quality approach doesn't end here. Some would claim that appearance and package instructions were minor in value . . .

JUST THE SAME–WE'VE

extended our "make it better" program to a dressing-up that pays off in convenience, use. Our new blue color gives case and packages a clean, distinctive appearance. Hard wearing surface of baked enamel on the case resists grease, dust. New, easy to read identifications and simplified instructions on many of the packages aid users. And our labeling meets the latest requirements of the U. S. Pharmacopeia and Food and Drug Administration.

GOT NEWS FOR YOU

too, in our case design. No overlapping lid to complicate handling, storage. Packages extend above the edge of the base, giving "finger room" for quick removal of any package. Tubular rubber gasket fits in metal channel in base, adds extra pressure, more contact surface when lid is closed. Truly an M.S.A. "All-Weather" feature.



You'll find news in our first aid materials, too. M.S.A. Swabs have gauze tips which are less absorbent to assure full utilization of antiseptic. Color keying of labeling assures positive, quick identification. Ammonia Inhalants contain pure, uncolored solution and are tested against leakage before shipment. Our Ammonia Ampoules feature a "color break" line that gives a clean, quick break. Label is printed on both protective sleeve and glass vial to safeguard against mis-use should sleeve be lost.

MSA
SAFETY EQUIPMENT HEADQUARTERS

AND THERE'S MORE, LOTS MORE . . . but seeing is believing. So call your M.S.A. man today for a demonstration. It's BIG NEWS!

MINE SAFETY APPLIANCES COMPANY
201 North Braddock Avenue, Pittsburgh 8, Pa.
82 Branch Offices in the United States and Canada
Cable Address "Minsaf"

formed to specialize in marketing and economic research. Industries to be served include chemical, gas, and petroleum.

Twenty-two representatives of 15 gas utilities completed American Meter Co.'s latest measurement school recently. Companies represented: Holyoke Gas & Electric, Connecticut Power, Mystic Valley Gas, New England Electric System, Dayton Power & Light, Western Kentucky Gas, Texas Gas Transmission, New York State Natural, Southern Natural, Southeast Alabama Gas District, Okaloosa Gas, Delaware Power & Light, Reading Gas, Chattanooga Gas, and United Fuel Gas.

The British Columbia government has established an up-to-date petroleum and natural gas division in view of the increasing importance of oil and gas exploration and development in the province. Plans are also under way to set up a conservation board.

CUT COST ON GAS LINE INSTALLATIONS WITH KA-MO DRILLING EQUIPMENT

Hydraulic Unit

Multiple Gas Line—Inside Steel Casing

HORIZONTAL BORING—for gas and oil pipelines, water, sewers, conduit, gas or electric services—with or without casing.

Drill inside pipe to maintain perfect line and grade—drill and pipe move forward in one operation.

UNDER—highways, railroad beds, streets, alleys, lawns, etc.

VERTICAL OR ANGULAR BORING—locating gas leaks, anchor and pole holes, preboring for piling, concrete piers, dewatering ground, soil testing.

BORES THRU—hardpan, gumbo, shale, some types limestone, other mineral formations, concrete walls, frozen ground.

• **Low initial cost** • **Fast, economical, easy operation** • **Complete mobility** •

POWERED BY			
AIR	HYDRAULIC	ELECTRIC	GASOLINE
4 H.P. to 18 H.P. or in dual or triple drives to 45 H.P.	11.6 to 50 H.P.	1.9 H.P. to 100 H.P.	Engine Drive

DRILL SIZES—2½" to 48" diameter and lengths to meet your needs.

We have many new machines that do not show in our literature. Write today for further information on custom made machines for special applications—let us help you cut your drilling costs.

KA-MO TOOLS, INC.

EARTH BORING EQUIPMENT

1845 SOUTH 55th AVE. • CICERO 50, ILL.

GAS calendar

May

Natural Gas & Petroleum Association of Canada—Hotel London, London, Ont., Canada.

2- 3. PCGA Distribution Conference—El Mirador Hotel, Palm Springs, Calif.

6- 7. AGA Residential Gas Section Eastern Sales Conference—Hotel William Penn, Pittsburgh.

7- 9. AGA Research & Utilization Conference—Cleveland, Ohio

8-10. Public Utilities Advertising Association Annual Convention—Hotel Statler, Cleveland.

8-10. Joint AGA-PCGA Gas Supply, Transmission & Storage Conference—Mark-Hopkins Hotel, San Francisco.

10. Southeastern Gas Association Emergency Procedure Conference—Selwyn Hotel, Charlotte, N. C.

12-15. LPGA Annual Meeting—Conrad Hilton Hotel, Chicago.

14-17. Institution of Gas Engineers—London, England.

16. NEGA Operating Division—Sheraton- Biltmore Hotel, Providence, R. I.

19-22. TIPRO Convention — Galvez & Buccaneer Hotels, Galveston, Texas.

20-22. AGA Mid-West Regional Gas Sales Conference — Edgewater Beach Hotel, Chicago.

20-22. AGA Chemical, Engineering and Manufactured Gas Production Conference — Balmoral Hotel, Miami Beach, Fla.

20-23. 29th Annual Exhibit of the Oil & Gas Power Division of ASME—Kentucky Hotel, Louisville.

21-23. Pennsylvania Gas Association Annual Meeting—Pocono Manor Inn, Pocono Manor, Pa.

22. NEGA Appliance Servicing Conference—Hotel Bancroft, Worcester, Mass.

22-23. PCGA Home Service Workshop—Georgia Hotel, Vancouver, B. C.

28-29. PCGA-AGA Regional Public Relations Workshop — Salt Lake City, Utah.

29-31. 12th Annual Short Course in Gas Technology—Texas College of Arts & Industries, Kingsville, Texas.

June

4- 6. Second Annual Appalachian Underground Corrosion Short Course—West Virginia University, Morgantown.

12-14. NEGA Gas Measurement School—Worcester Polytechnic Institute, Worcester, Mass.

23-25. Wisconsin Public Utilities Association Accounting Section Convention—King's Gateway Hotel, Land O'Lakes, Wis.

24-27. Canadian Gas Association—Jasper Park Lodge, Jasper, Alberta, Canada.

24-25. Michigan Gas Association — Grand Hotel, Mackinac Island, Mich.

September

3- 5. Pacific Coast Gas Association Annual Convention—San Francisco.

6. New Jersey Gas Association Annual Meeting—Spring Lake, N. J.

9-10. INGAA Annual Meeting—Shamrock Hilton Hotel, Houston, Texas.

9-13. AGA Industrial Gas School—Hotel William Penn, Pittsburgh.

10-12. Mid West Gas Association Gas School and Conference—Iowa State College, Ames.

12. NEGA Safety Conference—Hotel Statler, Boston.

13-14. Maryland Utilities Association 33rd Annual Fall Conference—Cavalier Hotel, Virginia Beach, Va.

16-18. AGA 9th Annual Accident Prevention Conference — St. Louis, Mo.

18-20. Southeastern Gas Association Convention—Robert E. Lee Hotel, Winston Salem, N. C.

October

1- 2. Texas Mid-Continent Oil & Gas Association 38th Annual Meeting—Texas Hotel, Fort Worth.

7- 9. AGA Annual Convention—Kiel Auditorium, St. Louis, Mo.

10-11. California Natural Gasoline Association Annual Fall Meeting—Huntington-Sheraton Hotel, Pasadena.

November

6. NEGA Operating Division—Hotel Statler, Hartford, Conn.

11-14. American Petroleum Institute—Conrad Hilton Hotel, Chicago.

1958
March

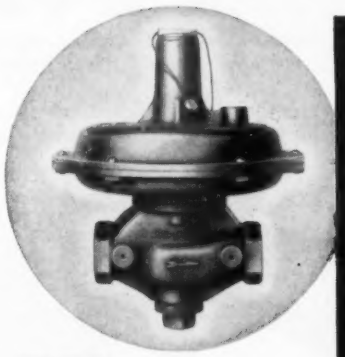
17-21. National Association of Corrosion Engineers—San Francisco.

20-21. New England Gas Association Annual Meeting—Hotel Statler, Boston.

24-26. Mid-West Gas Association — Broadmoor Hotel, Colorado Springs.

Steady

REYNOLDS LOW PRESSURE REGULATORS



PIPE SIZES:
¼" to 8"
¼" to 3" with screw connections
3" to 8" with flange connections

REPRESENTATIVES:

H. D. "Mike" Meuffels
423 Dwight Building
Kansas City, Missouri

Seidenglanz & Co.
2nd Unit, Santa Fe Building
Dallas, Texas

Eastern Appliance Company
281 Vassar Street
Cambridge, Massachusetts

Waldo S. Hull
258 Lee Circle
Bryn Mawr, Pennsylvania

Reynolds Low Pressure Regulators guarantee steady, constant, unvarying outlet pressure even though the volume varies and inlet pressure fluctuates. Precision built and delicately balanced for accurate performance on low pressure installations, the units illustrated are backed by factory tests over a wide range of operating conditions. Reynolds Low Pressure Regulators are economical and safe. Our Engineering Department is at your service.

GAS CONTROL Since 1892

Reynolds Gas Regulator Co.

ANDERSON, INDIANA, U. S. A.

GAS CONTROL SINCE 1892

1897 1957

PIPE STOPPERS OF ALL KINDS

SAFETY GAS MAIN STOPPER CO. INC.

GOODMAN — USED SINCE 1897 — 2" HANDLE & LOCKING SLEEVE — GAS MAIN STOPPER

523 Atlantic Avenue
Brooklyn 17, N. Y.
Cable Address GASTOPPER, N. Y.

GAS people

Hall M. Henry
NEGEA

James Stopford
Honolulu Gas

John Sholar
South Georgia

Stan Osborne
General Controls

HALL M. HENRY is the new president of NEGEA Service Corp., Cambridge, Mass. He succeeds the late Ralph D. Stauffer. In 1938 Mr. Henry became assistant to the president of New England Gas & Electric System. Subsequently he was vice president of the service corporation and director of gas operations for the system, a position held until now. Mr. Henry is currently vice president of Cambridge Gas Co. and Worcester Gas Light Co. and a director of the Algonquin Gas Transmission Co. In other changes, HARDING U. GREENE has been elected vice president and HORTON L. CHANDLER has been made a director of the NEGEA Service organization. Also, HAROLD W. ATKINSON has been promoted from assistant general manager to general manager of Cambridge Electric Light Co.

JOHN O. SHOLAR has been elected president of South Georgia Natural Gas Co., Thomasville, Ga. Mr. Sholar was executive vice president of the company. He joined South Georgia at the time of its organization in February 1955. Prior to that he was vice president of the South Carolina Natural Gas Co. and manager of the gas department of the South Carolina Electric & Gas Co.

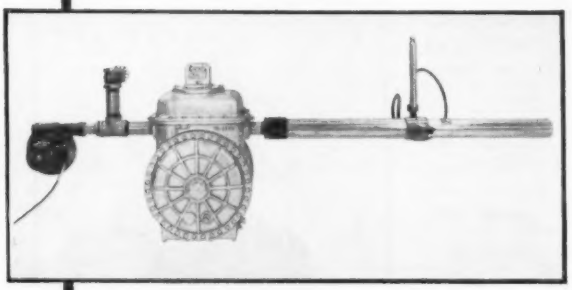
Honolulu Gas Co. has named JAMES C. STOPFORD president. Mr. Stopford, who has been vice president and general manager, has served as chief executive of the company since the death of Eugene Englebright last July. Mr. Stopford went to Hawaii in 1951, when he joined Pacific Refiners as chief process engineer. In 1952 he was made producton manager and in 1955 was elected vice president in charge of manufacturing and distribution with Pacific Refiners.

STAN OSBORNE is a new field representative for the Los Angeles branch of General Controls, Glendale, Calif. Mr. Osborne gained practical experience in the heating field while with Payne Furnace Co. for nine years. Most recently he was with Ashburn Supply Co.

H. S. CAIN has been appointed district sales engineer for Berry Hydraulics, a division of Oliver Tyrone Corp. Mr. Cain will be responsible for the Texas sales territory, working out of Houston. He was formerly in charge of produc-

CORROSION PROBLEMS?
call
perfex plastics
Specialists in Materials for
Replacement Service and
Leak and Corrosion Prevention
Everything you need—all from one dependable, experienced source. And because Perfex materials are held to specifications, because they're precision-engineered with close tolerances, you can be sure of lower costs, safer service. If you've corrosion problems, check Perfex for . . .
• PIPE—Tenite, Cycolac, P.V.C.
• INSIDE COUPLINGS plus cement and thinner for all three types of pipe.
• PROTECTOR SLEEVE scientifically engineered for renewal service, securing complete protection between old service and fitting at main where insertion method is used.
• ADAPTER FITTINGS (patented) enabling you to tie in metal and plastic service.
• PERF-A-SEAL #126—epoxy fiber-filled sealing compound . . . quick-curing (no heat required to cure). This Sealant gives you highest tensile, highest impact, highest burst strength and maximum corrosion-resistance.
Supplier to America's Leading
Gas Distribution Companies
perfex plastics
inc.
2632 S. DEARBORN ST., CHICAGO 16, ILL.

Prove Displacement Meters In the Field Quickly and Easily with AMERICAN® Flow Provers



Precision-built American Flow Provers provide quick and accurate proof testing of high capacity positive displacement meters in the field. Lightweight and portable, American Flow Provers are provided in 2, 3 and 4-inch models.

American Low Pressure Flow Provers, designed for hardcase displacement meter proof testing with air or gas at pressures below 15 psi, are supplied with calibrated orifice discs with proving rates to 10,000 cfh. Where gas cannot be conveniently discharged into surrounding atmosphere, a portable blower may be used.

American Critical Flow Orifice Provers, designed for 250 psi working pressure, are available with calibrated orifice discs for volumes to 6,000 cfh.

Consult your American representative for full information.

AMERICAN® METER COMPANY
INCORPORATED (ESTABLISHED 1836)

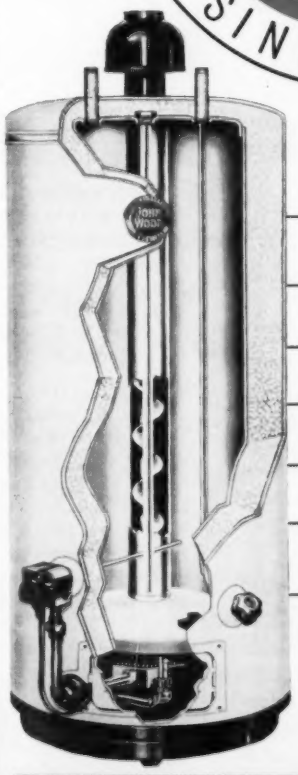
GENERAL SALES OFFICE: Somerton, Philadelphia 16, Penna. • Albany Alhambra • Atlanta • Baltimore • Birmingham • Boston • Chicago Dallas • Denver • Erie • Houston • Kansas City • Los Angeles • Minneapolis • New York • Omaha • Pittsburgh • San Francisco • Seattle Tulsa • Wynnewood. IN CANADA: Canadian Meter Company, Ltd., Milton, Ontario • Calgary • Edmonton • Regina

SUPPLIERS TO THE GAS INDUSTRY for Ironcase, Tinned Steelcase, Aluminumcase and Welded Steelcase Meters • American-Westcott Orifice Meters Instruments • Reliance Regulators • Apparatus • Valves

The inside story of America's finest automatic water heaters

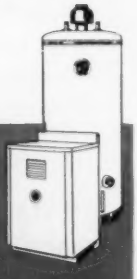
Glasslined and Galvanized in Upright and Table Top Models

QUALITY PRODUCTS
JOHN WOOD
SINCE 1867



The off-center flue makes the difference

- **Off-Center Flue** Travels the Heat Further
- **Extra Heavy Tanks**
- **Helical Heat Retarders**
- **Extra Heavy Insulation**
- **Extra Heavy Outer Shell**
- **Extra Heavy Bottom Pan**
- **Combination Thermostat and Safety Pilot** with Built-in Filter



JOHN WOOD COMPANY
Heater and Tank Division
Conshohocken, Pa. • Chicago, Ill. • Red Oak, Ia.

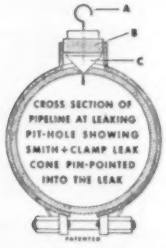
Safer...Quicker Pipeline Repairs

WELD + ENDS Permits Welding a Pipeline While Pumping Through It

A pipeline safety welding coupling for crude oil, gas, gasoline, asphalt, steam, chemical process and other pipelines. WELD + ENDS joins pipe securely so flow can be resumed immediately at full pressure. Welding can be performed while pipeline is in use days or weeks later. Sizes 2" to 36".

• • •

Smith + Clamp Permits Plugging and Welding Pit-Hole Leaks in a Pipeline While Pumping Through It



Smith + Clamp shuts off more easily, quickly and safely than ordinary clamps. Use on high and low pressure gas, gasoline, crude oil, water, steam, air, chemical process and other pipelines. Sizes 1" to 30". Combine with WELDPLATE when pipe reinforcement is specified.

Write today for complete information on these latest developments in safer, quicker pipeline repairs: Weld + Ends and Smith + Clamp. Address Dept. J1.

THE PIPE LINE DEVELOPMENT CO.

5700 DETROIT AVE., CLEVELAND 2, OHIO

people • *Continued*

tion and application engineering at the Corinth, Miss., plant.

Three organizational changes in the Connecticut Light & Power Co.'s industrial sales department have been announced. KENNETH L. HENRY is now industrial sales engineer in the Waterbury district; RALPH O. SMITH succeeds Mr. Henry as industrial sales engineer in the Meriden district; and FREDERICK W. RIGGS JR. succeeds Mr. Smith as sales engineer in Essex.

Haartz-Mason Inc., Watertown, Mass., has named ANTHONY F. PETRITZ as manager of the mechanical products division. R. WAYNE BURGESS is assistant to the manager.

HOWARD D. KRAFT has been appointed commercial sales consultant in the sales and public relations consulting department of Ebasco Services Inc., New York.

Walworth Co., New York, has named FREDERICK M. JACKSON as vice president in charge of sales and GEORGE E. MCDONALD vice president and treasurer.

WILLIAM S. BEATTY has been elected assistant treasurer of New York State Natural Gas Corp., Pittsburgh. Mr. Beatty joined Peoples Natural Gas Co. in 1939 and in 1953 he became chief accountant in New York State Natural's treasury department.

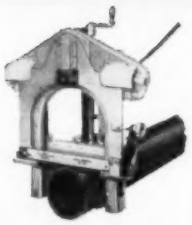
Newly elected treasurer of New York State Natural Gas Corp. is ARTHUR R. BLOTTER. Mr. Blotter began working for the Peoples Natural Gas Co., sister company of New York State Natural, in 1938. He transferred to New York State in 1951 as chief accountant and in 1953 became assistant treasurer.

William Beatty
N. Y. State

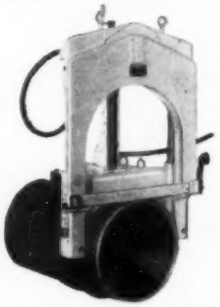
Arthur Blotter
N. Y. State

WACHS

PORTABLE POWER AND MANUAL PIPE CUTTERS 2" TO 72" CAPACITY

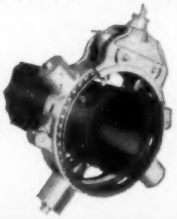


WACHS GUILLOTINE SAW
2" to 8" Capacity
Electric or Air Drive



"BIG" GUILLOTINE SAW
10" to 16" Capacity

WACHS NATIONAL SAW
"The milling machine on wheels"
Cuts 10" to 72" Pipe



WACHS STRICKLER RATCHET CUTTER
"Lathe Type Cuts"
5 sizes—2½" to 24" Capacity
Write for descriptive bulletins

THE E. H. WACHS COMPANY
Manufacturers of Engines, Valves and Machinery since 1893
1525 NORTH DAYTON STREET
CHICAGO 22, ILLINOIS

JOSEPH D. CARNES has succeeded CHARLES F. CRAMER as superintendent of motor transport for the Toledo district of the Ohio Fuel Gas Co. Mr. Cramer retired recently after 41 years with Ohio Fuel.

R. J. MUNZER, former executive vice president and general manager of Petrolane Gas Service Inc., Long Beach, Calif., has been named president. He succeeds P. E. FOOTE, who held the position concurrently with that of chairman of the board. LEONARD ANDREWS, former vice president, is now executive vice president.

RAYMOND E. BURTON, assistant sales manager for Koehring Division, Milwaukee, has been appointed to the new post of assistant director of marketing for Koehring Co.

Two new operating divisions have been formed by New York State Natural Gas Corp., Pittsburgh. The new southern division, with headquarters at Jeannette, will have DONOVAN C. WISE as superintendent. C EARL ALTMAN is superintendent of the new central division at Luthersburg.

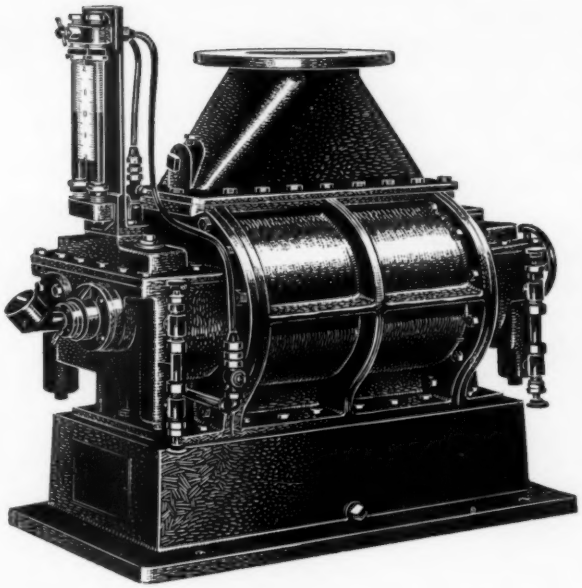
PATRICK N. MORGAN is now assistant to the vice president and general sales manager of the heater and tank division of John Wood Co., Conshohocken, Pa. Mr. Morgan was formerly manager of sales for heating and air conditioning products with Combustion Engineering Inc.

ALFRED L. HARTRIDGE, vice president and treasurer of Stone & Webster Engineering Corp., New York, has been elected a director of the company.

Five organizational changes have been made in the gas department of Connecticut Light & Power Co., Berlin, Conn. KURT RICHTER, district gas engineer at Waterbury,

Kurt Richter
Conn. Light

Francis Aiken
Conn. Light



R-C rotary positive displacement meters retain "cash register" accuracy

For utility metering or proportioning of process gas, Roots-Connersville rotary gas meters assure permanent accuracy unmatched by any other design.

- 15:1 accurate operating range.
- Accuracy is not affected by variations in specific gravity, rate of flow, pulsations or impurities.
- Precision machined measuring chambers insure maintenance-free accuracy.
- No valves, diaphragms or other small parts are used, eliminating leakage due to wear.

R-C meters will meet your most exacting requirements in capacities from 2,000 to 1,000,000 cfh. Write for Bulletin M-152 for complete specification details.

Engineers—unusual career opportunities await you at Roots-Connersville. Address your resume to Professional Employment Manager.

ROOTS-CONNERSVILLE BLOWER

A DIVISION OF DRESSER INDUSTRIES, INC.

557 Oregon Ave., Connersville, Indiana. In Canada — 629 Adelaide St., W., Toronto, Ont.

Featherweight FLOATING ACTION — ANOTHER BIG LANCASTER ADVANTAGE

New Lancaster S-700 Complete Diaphragm with Built-in Adjustable Carrier Wire Assembly

For 1-A Sprague Gas Meters

With a lighterweight center assembly and smoother floating action, it's no wonder that Lancaster's new S-700 is becoming so popular with meter men who want the best possible meter accuracy.
But accuracy is only one of Lancaster's important advantages. With the adjustable carrier wire assembly an integral part of the diaphragm . . . it's a lot easier and faster to install a Lancaster S-700 diaphragm.

Prove it to yourself. Send for a sample today — leather or synthetic.

Lancaster METER PARTS CO.
Manufacturers of Quality Parts for Gas Meters
POST OFFICE BOX 378 LANCASTER, OHIO

CLIP THIS AND MAIL TODAY
if you have not subscribed to . . . GAS

GAS 198 SOUTH ALVARADO STREET, LOS ANGELES 57, CALIFORNIA
Standard Rates Apply to U. S. & Possessions

☐ Check herewith ☐ Bill me ☐ 2 years $3.00 ☐ 1 year $2.00

Name _____ Title _____
Firm _____
Street _____
City _____ Zone ____ State _____

U. C. Fleming Jr.
Conn. Light

M. F. MacGregor
Conn. Light

has been named to the newly created post of gas planning engineer. FRANCIS R. AIKEN, assistant engineer at Berlin, is now gas distribution engineer at Waterbury. URBAN C. FLEMING JR., an engineer at Berlin, is now gas operating engineer. MERTON F. MACGREGOR, an engineer at Waterbury, has been transferred to Berlin to assist Mr. Richter and Mr. Fleming. WILLIAM H. BARKER JR., assistant engineer at Waterbury, has been named engineer and transferred to the company's south gas plant at Waterbury.

GERRY POWELL, manager of White-Rodgers Co.'s Chicago region, has been named assistant sales manager. He will headquarter in St. Louis and serve directly under Russell A. Sherer, sales manager, surpervising the company's regional sales offices on a direct field contact basis.

MARK H. HARRINGTON, director of law; WILLIAM D. MESSENGER, director of accounting; LEE A. WELLS, director of sales; MELVIN G. JOHNSON, director of production; and RAY M. WAINWRIGHT, director of engineering, make up a new executive staff at Good-All Electric Manufacturing Co., Ogallala, Neb. The staff forms a liaison between the president, Q. T. WILES, and the general managers of the

W. H. Barker Jr.
Conn. Light

Gerry Powell
White-Rodgers

various divisions of the company, its subsidiaries and affiliates.

Several new sales representatives and engineers have been named by American Meter Co., Philadelphia. New sales representatives are ROY C. MITCHELL, who will work in the Rochester, N. Y., area; DONALD E. KOHART, working out of the Boston sales district; and JOHN Q. VREELAND, who will work in the company's Wynnewood, Pa., sales district. BYNUM C. JACOBSEN is a new sales engineer in the Chicago sales district and CLIFFORD E. SAYLOR is an engineer in the telemetering department of the company's Erie, Pa., plant.

ARDON B. JUDD is the newly elected president of Southwest Fabricating & Welding Co., Houston, a subsidiary of Walworth Co. FRED W. BELZ, president of the parent company, becomes chairman of the board of Southwest.

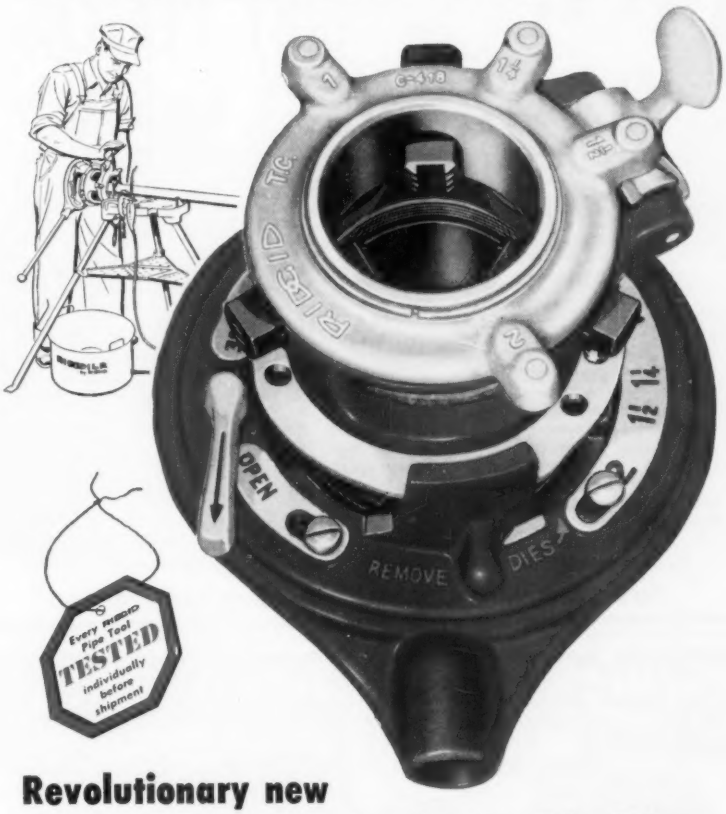
SEWELL L. AVERY, formerly chairman of the Board of Montgomery, Ward & Co., has retired as a director of Peoples Gas Light & Coke Co., Chicago. Mr. Avery's length of service on the Peoples Gas board exceed that of any of its other directors. He served continuously since 1933.

ESKIL I. BJORK, president of Peoples Gas Light & Coke Co., Chicago, since 1952, will become chairman and chief executive officer on June 1. He succeeds JAMES F. OATES JR., who is leaving to become president and chief executive officer of Equitable Life Assurance Society in New York. Succeeding Mr. Bjork as president of the parent company is JOSEPH J. HEDRICK, who has been president of its subsidiaries, Texas Illinois Natural Gas Pipeline Co. and Natural Gas Pipeline Co. of America. REMICK MCDOWELL, vice president in charge of finance and public relations, will serve as executive vice president of Peoples Gas, a new position.

From his beginning as a ledger clerk in 1920, Mr. Bjork advanced through various phases of company operations. In 1930 he was elected assistant secretary; in 1936 vice president in charge of purchasing, budgeting, stores and priorities; in 1945 vice president in charge of finance and industrial relations; and then the presidency in 1952.

RIDGID Jamproof 65R

Now Guarantees
Straight Threads Every Time



Revolutionary new
TC (True-Centering) Workholder
centers all pipe, even over or under size

No more crooked threads! 65R pre-sets to size by turn of TC workholder gauge ring—tightens by palm-of-hand push on forged cam lever. All 3 jaws close together on pipe by one mechanical action.

Straight threads, drip threads if desired, jamproof, 1″ to 2″ with 1 set of dies, fast size change—only 65R offers you so much for your money. Buy it at your Supply House.

P. S. The new TC workholder fits your present 65R!

The Ridge Tool Company, Elyria, Ohio, U. S. A.

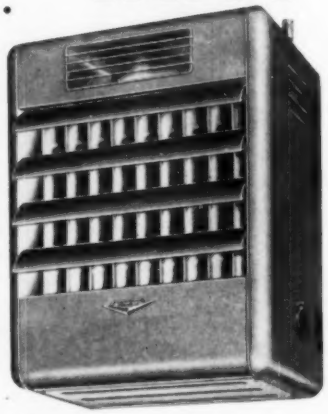
RIDGID
Work-Saver Pipe Tools

MORE Peerless GAS FIRED UNIT HEATERS

ARE BEING INSTALLED THIS YEAR THAN EVER BEFORE.... WHY?

. . . CHANGE FOR THE BETTER — IS THE ORDER OF THE DAY

Peerless is NEW — it's changed . . . to give more for the money, to fit the times . . . to fit the needs for today and tomorrow. A Unit for every purpose . . . New lower prices . . . New neutral gray-green color . . . New cabinet styling . . . More compact . . . Economical to operate . . . Easier installed . . . Quieter operation . . . Greater heat distribution . . . Proved engineered principles . . . Virtually no maintenance . . . Fan or blower in every size . . . Rugged and dependable.



Write for literature on tomorrow's unit heaters today

PEERLESS MANUFACTURING CORP.- LOUISVILLE 10, KY.

Koenig ALL-STEEL CABS for JEEPS
FULL AND HALF CABS

Full Cab and Model 151J King Winch Illustrated

★ Protection
★ Comfort
★ Safety
★ Convenience

Roll-down windows, full opening . . . full panel-board head lining and masonite door lining . . . safety glass throughout . . . all-steel welded construction . . . door locks.

KING WINCHES

King Winch on R-140 and R-160 International

There's a front-mount King Winch designed to fit your specific needs . . . for ½-ton through 2½-ton trucks . . . pulling capacities of 8,000 to 19,000 lbs.

P.T.O.-driven King Winch on Willys Jeep FOR ALL WILLYS JEEPS, 4 WD TRUCKS AND 4 WD STATION WAGONS.

Power-take-off-driven King Winch models 130J and 131J for CJ-3B and older-model Jeeps, can be transferred to CJ-5 and CJ-6 Jeeps . . nothing extra needed.

Koenig cabs and King Winches for Willys vehicles available through all Willys Motors, Inc., dealers and distributors in U.S.A. . . . and Willys-Overland Export Corp. distributors in other countries.

Koenig IRON WORKS, INC.
WEST 12th AND ELLA BLVD., HOUSTON 7, TEXAS

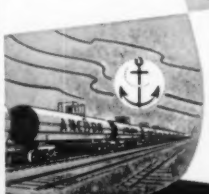
ANCHOR'S BUTANE & PROPANE STAND-BY PLANT PACKAGE

ENGINEERING, INSTALLATION

Anchor's Engineering Dept. will design and supervise plant construction.

FINANCING

Anchor's experienced staff will assist with the financial details..



SUPPLIES

Huge tank car fleet, many plants and vast underground storage assure adequate supplies.

ANCHOR
PETROLEUM COMPANY
TULSA — CHerry 2-7261

people • *Continued*

T. J. Watt
Sprague

R. G. Burr
Sprague

THOMAS J. WATT and ROBERT G. BURR are advertising manager and assistant advertising manager, respectively, of Sprague Meter Co., Bridgeport, Conn. Mr. Watt, who has been with Sprague since 1929, will also act as service manager for the company. Mr. Burr, who is also assistant service manager, has been with the company since 1949.

PAUL J. IMSE, vice president and secretary of the Milwaukee (Wis.) Gas Light Co., has been elected a director of the company. Mr. Imse, who has been with Milwaukee for 51 years, replaces Henry Fink, president of Michigan-Wisconsin Pipe Line Co. and American Louisiana Pipe Line Co., who has retired from the board.

ROBERT B. ADAM, president of Adam, Meldrum & Anderson Co. Inc., Buffalo, is a new member of the board of directors of New York State Electric & Gas Corp., Ithaca, N. Y.

Deaths

LUCIUS E. INGHAM, 65, former vice president and director of Texas Gas Transmission Corp., died of a heart attack in St. Petersburg, Fla., on March 2. Mr. Ingham retired on Feb. 1 after more than 46 years in the natural gas industry. He started his career with United Natural Gas Co., Oil City, Pa., in 1910. Later he worked with Iroquois Gas Corp., Natural Gas Engineering Corp., Columbia Engineering Corp., and Michigan Gas Transmission Corp. He joined Kentucky Natural Gas Corp., a Texas Gas predecessor, in May 1939 as assistant to the president. He became vice president on Jan. 1, 1943. He continued in his vice presidential capacity after Kentucky Natural and Memphis Natural Gas Co. were merged into Texas Gas on April 1, 1948.

GAS

associations

Record crowds expected at SGA New Orleans meet

More than 2000 gasmen are New Orleans bound for the 49th annual convention of the Southern Gas Association which will convene on April 29.

Convention headquarters for the three-day meeting will be in the Roosevelt and Jung hotels. Murray S. Hitchcock, Atlanta district manager of American Meter Co., is general convention chairman for the 1957 convention.

Here are some program highlights, section by section:

Accident Prevention — SGA's president, R. A. Puryear, Jr., president of Alabama Gas Corp., will discuss "Safety Is as Safety Does" at the first session on Monday morning. Following him will be J. E. Miller, vice president of Goodrich Gulf Chemicals, Inc., discussing "Management's Responsibility to Safety." A safety quiz with prizes for the winners will be preceded by Dr. Arthur Secord, director of community service at Brooklyn (N. Y.) College, who will tell "How to Sell the Safety You Know."

Accounting—Management training is the subject of V. K. Rowland of Detroit Edison Co. H. H. Scaff, Ebasco Services Inc., will point out some recent accounting trends. In addition, there will be a symposium on plant accounting methods and procedures and discussions on depreciation accounting and internal control.

Distribution — Scott Hughes, Southern Union Gas Co., will outline "Legal Aspects of Distribution Operation"; W. H. Donovan, Alabama Gas Corp., will discuss "Telemetering and Remote Pressure Control"; and the steel pipe situation will be reported by A. J.

SPEED GAS WORK

with Bucyrus-Erie Hydrohoe and 5 Interchangeable Tools

WRIST-ACTION DIPPERS *are quickly interchangeable. Standard 18-in., shown above, narrow 12-in., or wide 24-in. cut the size trench you need . . . save time and expense by reducing amount of backfilling needed. Side cutters are available for these dippers for cutting trenches of additional width.*

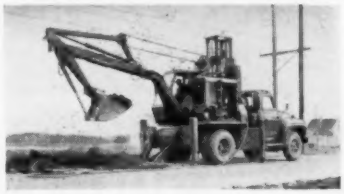
The all-hydraulic Bucyrus-Erie Hydrohoe combines the speed and maneuverability of a conventional truck, the precision of hydraulic power and control, and the added versatility of five special tools to give you *the machine* best suited to gas work.

When you see it in action, you'll be convinced that the Hydrohoe is the one machine designed to meet a great variety of gas jobs. Contact your nearby Bucyrus-Erie distributor now. He will be glad to demonstrate.

168H56

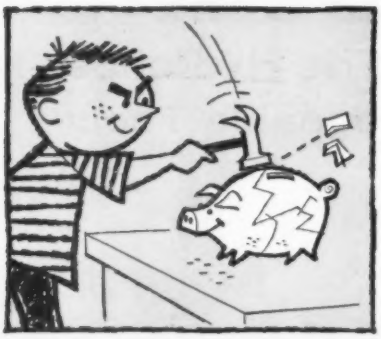
SPECIAL UTILITIES DIPPER, *at right, is 20 inches wide, is designed especially for digging deep, short length holes. Rotating through an arc of 95 degrees, this dipper permits undercutting sides, squaring corners . . . reduces hand trimming on manhole, valve or repair excavations . . . reduces amount of backfill required and amount of concrete or black top resurfacing.*

COMBINED POWER UNIT AND AIR COMPRESSOR, *at right, mounted on the Hydrohoe gives you plenty of power for a variety of air tools without the usual transporting problems. This optional combined unit delivers 120 cfm against 100 psi.*



BUCYRUS ERIE

SOUTH MILWAUKEE, WISCONSIN



What's inside makes a big difference!

Unexpected pressures – require unusual precautions. The Vulcan Synthetic Diaphragms in your regulators give the utmost in accurate performance–from fractions of inches w.c. to hundreds of pounds pressures.

Specify Vulcan . . . and be sure

Another REEVES VULCAN RUBBER PRODUCT

REEVES BROTHERS INC.

Vulcan Rubber Products Division

54 Worth Street, N. Y. 13, N. Y.

Gas Meter Diaphragms
Diaphragms for Regulators & Controls

associations • *Continued*

Elbert of National Tube division.

Home Service—Monday's luncheon will be devoted to home service, with Julia Meade of "Playhouse 90" as guest. Frank Trembly, Philadelphia Gas Works, will describe the gas industry's program for home service.

Sales—A symposium on air conditioning will feature the Tuesday afternoon session. Participants include A. E. Schwarz, Ebasco Services; G. J. Tankersley; Andrew F. Cassidy, Rheem Manufacturing; and Zenn Kaufman. Another symposium on selling and advertising will highlight the sales sessions.

Transmission — Technical problems will be aired at Tuesday afternoon's session. Laurence S. Reid, Foor Engineering Co., will discuss "Efficiencies of Two-Phase Flow in Gas-Condensate Gathering Systems"; B. C. Joyce, Bristol Co., "Safeguarding Telemetering Controls"; and C. F. King, Fisher Governor Co., "Energy Dissipation Problems Encountered in Regulator Manifolds."

Manufacturers joining in restaurant show

Fourteen cooperating manufacturers will occupy nearly 5000 sq ft of floor space at the 38th National Restaurant Exposition in Chicago in May. This will be the largest AGA combined commercial gas exhibit.

Several newcomers will be under the Blue Flame banner this year and many innovations will be featured, including new high-speed top burners. Highlight of the show will be the new automatic ignition equipment which is now mandatory on all approved range ovens, portable deck ovens, and deep fat fryers. Three exhibitors will have live exhibits, demonstrating a coffee urn, simulated charcoal broiling, and a steamer.

Rhodes installed as NEGA head

The New England Gas Association installed E. G. Rhodes as its new president during its recent annual business conference in Boston.

What's inside makes a big difference!

A "jumpy", inaccurate diaphragm in your meter plays costly tricks on good will and revenue.

Using Vulcan Synthetic Diaphragms takes the guesswork out of metering–you *know* you have dependable, sensitive, accurate diaphragm action.

Specify Vulcan . . . and be sure

Another REEVES VULCAN RUBBER PRODUCT

REEVES BROTHERS INC.

Vulcan Rubber Products Division

54 Worth Street, N. Y. 13, N. Y.

Gas Meter Diaphragms
Diaphragms for Regulators & Controls

Mr. Rhodes, president of the New Britain (Conn.) Gas Light Co., succeeds Fred H. Faulstich, Springfield Gas Light Co., as the NEGA's leader. Other new offices of the NEGA are: Andrew W. Johnston, Boston Gas Co., 1st vice president; G. R. Copeland, Algonquin Gas Transmission Co., second vice president; Otto Price, Boston Gas Co., treasurer, and Clark Belden, managing director of the NEGA, clerk.

Speakers at the business conference stressed the need of more sales effort by gas companies in the years ahead. Following are excerpts from remarks made by some of the top gas industry officials who appeared at the NEGA meeting.

* * * * *

Leon Ourusoff, assistant to the senior vice president of the Washington (D. C.) Gas Light Co., discussed "All-Year Air Conditioning Sales Possibilities."

Mr. Ourusoff had an optimistic outlook for gas air conditioning: "Gas equipment of excellent quality is now available to accommodate every commercial establishment from a small beauty parlor to a giant shopping center or a skyscraper.

". . . All-in-all, the picture for commercial gas air conditioning is becoming increasingly bright. Let me stress, however, that a tremendous contribution must be made by gas utilities in two ways: first by impressing the facts of life upon the minds of consulting engineers and architects and secondly by acting as bird dogs for the equipment manufacturers, who, in turn, should handle actual sales transactions, including engineering and contracting.

". . . If we look at the year-round picture we find that, economically, the cards are very badly stacked against the electric heat pump, but this certainly has not been an obstacle to promotion of that type of equipment. . . . These heat pumps are higher in first cost and operating cost than present-day gas year-round equipment, so . . . the conclusion to draw is that current sales possibilities for residential air conditioning are just exactly what you are willing to make them."

* * * * *

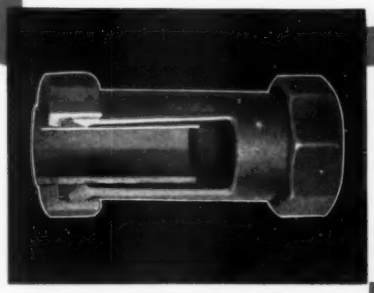
GAMA president Julius Klein had some pertinent comments regarding unified promotional pro-

(*Continued on page* 118)

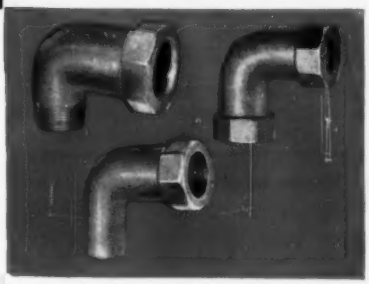
NORMAC

Couplings, Sleeves and Fittings for ☆ UNIFORMITY ☆ DEPENDABILITY ☆ ADAPTABILITY

Normac gas distribution products are engineered and manufactured to meet every requirement of modern gas distribution. Write today for catalog.

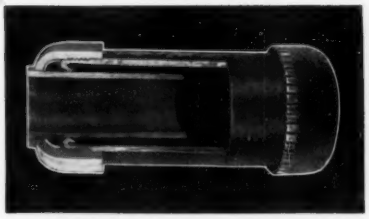


NORMAC COUPLINGS
Normac malleable couplings and sleeves offer the ultimate in deflection and strength with a center wall thickness greater than the wall thickness of the service pipe on which they are used. Every Normac fitting is individually air tested.



COMPRESSION-END "ELLS"
Normac ells of all types incorporate every feature of the Normac coupling plus full coupling depth.

COMPRESSION-END SERVICE "TEE"
Full coupling depth. Special threads on male end prevent dropping into old hand taps.



NORMAC #50-A STEEL COUPLINGS
Manufactured from extra heavy wall pipe. Couplings are available with either seamless or welded centers in sizes from ¾" to 1½" inclusive. 10" and special length centers available.

Normac also manufactures a complete line of red brass fittings in O.D. sizes: ⅝", ⅞", 1⅛", 1⅜"—and a complete line of insulated couplings and fittings.

NORTON-McMURRAY MFG. CO.
122 South Michigan Avenue — Chicago 3, Illinois

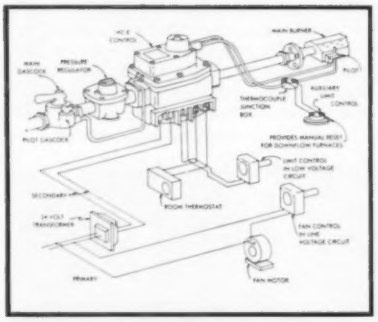
Couplings · Riser Bars · Sleeves · Cocks · Ball Joint Clamps · Service Tees & Ells

Gas Digest

A digest of what's new in products and trade literature compiled by the editors of GAS as a reader service.

New Products and Trade Literature

For more data on any of these items use the Readers' Service Card on pages 115, 116



1. Home heating control

An electric actuator, which insures quiet operation, is featured in Grayson Controls' new home heating control. Actually, Model HC-E is two controls in one unit: (1) automatic pilot with thermomagnetic, 100 per cent gas shutoff, built-in pilot filter, and pilot adjustment; and (2) noiseless, positive snap-action gas valve.

Instead of obtaining a differential movement from the thermal expansion and contraction of the copper tube with respect to the Invar Rod, movement is obtained by applying heat to the actuator from an external source of electricity. When electric current is interrupted by the opening of room thermostat contacts or other switching devices, the rod cools and allows the clicker to snap back, shutting off the gas supply.

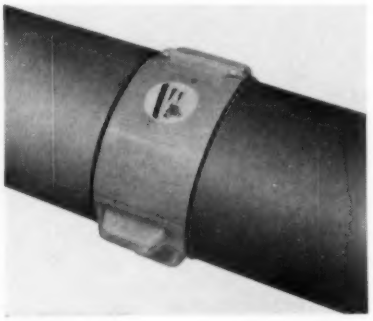
Grayson Controls Division

2. Pocket-size receiver

Radio Corp. of America has developed a commercial, pocket-size frequency modulation radio receiver for mobile communication service.

This micro-miniature receiver is the forerunner of a complete line of revolutionary RCA personalized receivers and transmitters for commercial communications. It is a fully transistorized, 10-oz instrument designed to provide extensions of several miles for radio systems now operating on the 150-megacycle band. The FM receiver can also be used to take direct or relayed transmission from both fixed and mobile stations.

Radio Corp. of America

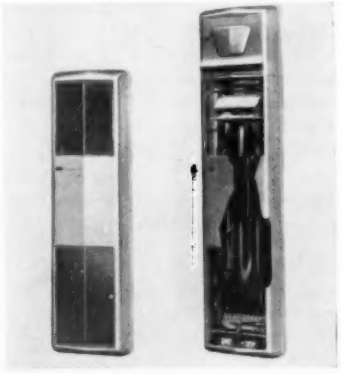


3. Insulator

A new rugged insulator for big-inch pipelines is available from T. D. Williamson. The WmSON "Steel Clad" insulator is for use in oversize casings under highways and railroads. It is available for all pipelines 16 in. and larger.

Design features include hollow forged steel runners, machine welded to a one-piece flexible steel band. Test load is 92,550 lb per runner. The "sling joint" prevents butt edges of the band from digging into the pipe coating. A thick insulating liner of oil resistant rubber secured to the high-tensile steel band provides positive insulation.

T. D. Williamson Inc.



4. Wall heaters

High efficiency and maximum safety are offered in Coleman's six new gas-fired wall heaters.

Four single wall heaters, including two with rear register attachments, and two dual wall units are featured in the 1957 line. All are designed to fit between wall studs on 16-in. centers. Single wall units have input ratings of 25,000 and 36,000 Btu. Dual wall models are rated at 50,000 and 62,500 Btu.

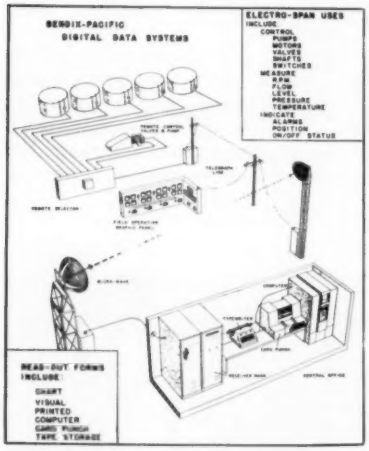
Major feature of the new design is a furnace-size combustion chamber with deep-drawn vertical corrugations to give greater heating surface and increase air flow.

Coleman Co.

5. Separator

A new short shell length separator for maximum conservation of oil and gas is being produced by National Tank Co.

Known as the COG, the new unit is a vertical low pressure separator with the shortest practical shell length. It is designed to operate at the lowest possible pressure, yet have sufficient pressure at all times to push oil through the lines into tanks. Oil carry-over into gas lines is prevented.
National Tank Co.

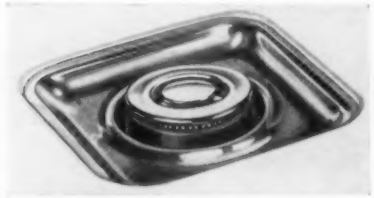


6. Remote control system

"Push-button" operation of complex industrial processes is claimed by the "Electro-Span" developed by the Pacific division of Bendix Aviation Corp.

According to the company, the new remote-control telemetering system is applicable in almost any situation where it is desirable or geographically necessary to separate a human supervisor from the device or installation he is supervising.

The system performs on commonly used communication channels —telegraph circuits, telephone lines, VHF radio or microwave links. It operates through the reception and transmission of automatically coded "questions," "reports" and "commands" over circuits connecting the control point with the remote installation.
Bendix Aviation Corp.



7. Top burner

New cooking benefits are derived from Geo. D. Roper's new top burner.

According to the company, a distinct advantage of the new burner is its Circle-Simmer burner. Rather than concentrating the simmer flame in a small area, the new burner spreads it in a circle around the edge of the burner. A larger area is covered and all utensils are heated more uniformly.

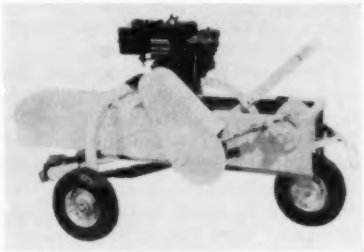
Another advantage is reported to be a smaller, more thrifty "keep warm" flame made possible by an auxiliary burner within the major burner. The heat spread is greater, making possible more heat speeds.
Geo. D. Roper Corp.

8. Batteries

Two lines of C & D batteries have been engineered to provide instantaneous emergency standby power in unattended, out-of-the-way microwave transmission and relay stations.

Both lines of batteries feature durable, one-piece, shock-resistant, clear plastic cases built to withstand rough handling in rugged terrain. Lighter weight permits easier transportation to remote locations.

High-low level lines for instant indication of electolyte level, ball cage indicator to show state of charge at a glance, and Saftee-Vent to protect personnel from accidental explosions are additional features contained in the batteries.
C & D Batteries Inc.



9. Automatic trencher

Cosom Engineering has introduced its new trencher which automatically propels itself by aircraft cable winch drive. This unit digs trenches 2¼ in. wide at depths of 12, 18, or 24 in. The trencher automatically stops trenching when it reaches the end of the cable.

The light weight, portable machine is powered by a 2¾-hp gasoline engine. The machine's drive and trenching mechanism are shielded to assure accident-free operation. According to the company, the ground saw rolls on the lawn and will not damage turf.
Cosom Engineering Corp.

10. Millivoltmeter

Millivoltmeter for checking the voltage output of safety thermocouples on gas-fired equipment is available from Simpson Electric.

Named Model 387, the new pocket-size tester is simple to use. The lead clips are merely placed across the thermocouple terminals to tests for correct voltage.

Ranges are 10, 30, 100, 300, and 1000 millivolts. Large binding posts, labeled by an engraved-filled panel, are used for range selection. Accuracy is 3 per cent of full scale at ambient temperatures of 50° to 120°F.
Simpson Electric Co.

11. Facsimile instrument

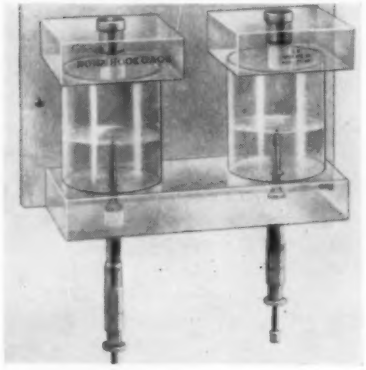
Exact duplicates of written messages and data are transmitted to companion machines over telephone wires by a new facsimile instrument.

Air Associates has incorporated several new developments in the Electronic Messenger. These include automatic gain control, automatic sensing of various background colors, contrast controls accessible to the operator. Other features are better accessibility for service, plug-in relays, and quick conversion of speed and band width to fit the transmission facility.
Air Associates Inc.

12. Water heaters

Two new series of glass-lined, gas-fired water heaters are available from the Permaglas division. Some of the gas-fired models feature an adaptation of a new target burner that increases Btu input.

The PGO series, replacing the old PGR, offers completely enclosed controls and aqua-trim styling. Sized from 20- to 65-gal. capacities, the PGO ranges in overall height from 46½ to 65 in. The larger burner gives input factors of 25,000, 36,000, 50,000 and 60,000 Btu/hr for the 20-, 30-, 50-, and 65-gal. models respectively.
A. O. Smith Corp.



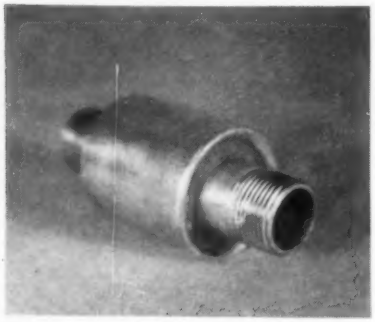
13. Hook Gauge

Critical low pressure and vacuum measurements are simplified by F. W. Dwyer's new transparent hook gauge.

The gauge is an accurate standard for all types of industrial test work and scientific laboratory use. Accuracy for the full scale range of 0-2 in. of water is within plus or minus .001 in.

The gauge is suitable for all applications except fluctuating pressures. It is especially valuable in checking and adjusting delicate instruments used for measuring air flow, and making precise lab draft tests.

F. W. Dwyer Mfg. Co.

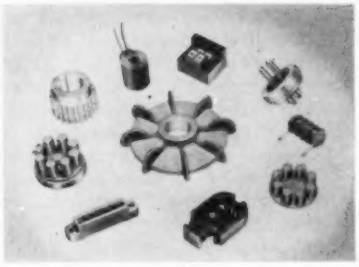


14. Insulating nipple

A newly developed insulating nipple is available from A & H Engineering Co.

The two nipples are firmly bonded and electrically separated in a coupling using a tough epoxy resin. The resulting insulating nipple is a low-cost method of insulating pipe. It is available in any size and in steel-to-steel or copper-to-steel types.

A & H Engineering Co.



15. Custom molding

Compression and transfer techniques are available from Epoxy Products for custom molding of electronic and chemical resistant products. Many products, such as connectors, impellers and housings, pipe fittings, disc pistons for meters, pump components, can be custom molded by the company.

Epoxy Products Inc.

16. Wheel-type ditcher

Barber-Greene is expanding its diversified line of crawler-mounted and rubber-tired vertical boom and ladder-type ditchers with a wheel-type ditcher.

The new unit, Model 774, is a crawler-mounted unit featuring a 5-ft 6-in. digging depth and widths, adjustable in 1-in. increments, from 18 to 30 in.

Innovations include use of hydraulic power transmission, flexible connection between chassis and digging wheel; an electric magnetically actuated overload release clutch; and a reversible, hydraulically driven spoil conveyor.

Forward crowding speeds on the wheel ditcher are controlled through Barber-Greene's hydraulic drive, "Hydracrowd." By moving a single valve, the operator can instantly select from an infinite range of forward speeds from 0 to 28 ft per minute. These speeds are entirely independent of the digging wheel speeds, which are controlled separately through a mechanical transmission.

Barber-Greene Co.

17. Speed reducer

A new worm-gear speed reducer that incorporates antifriction ball bearings both for input and output shafts has been developed by Tulsa Winch.

The new reducer, Model G4S, provides 29:1 reduction. It is rated at 875 lb-ft output torque, and is designed for intermittent operation. Weight is held to 36 lb by use of cast-aluminum housing.

Tulsa Winch Co.

18. Packaged boiler

By means of new factory-assembly methods, Bryant Manufacturing Co. has cut installation time for its Model 26 gas-fired boiler. Five sizes—from 67,500 to 157,000 Btu/hr—of the residential water boiler are being assembled. The only parts not installed at the factory are the draft hood, the transformer, and the pressure relief valve.

One of the Bryant features incorporated in the Model 26 boiler is the automatic pilot that permits the flow of gas to burners only when gas pressure is adequate. The diaphragm valve uses gas pressure itself to control gas flow.

Bryant Manufacturing Co.

19. Measuring wheel

Physical inventories, main extension measurements, map corrections, street opening surveys, locating paving cuts are some of the uses for the new Rolatape measuring wheel.

Rolatape measures around corners and contours with equal facility and accuracy. In operation, the handle is unfolded, the counter is set, and the operator begins walking. Rolatape does the measuring. For longer distances, the measuring wheel can be operated by the driver of a car as he drives slowly over the course to be measured.

Rolatape Inc.

TRADE LITERATURE

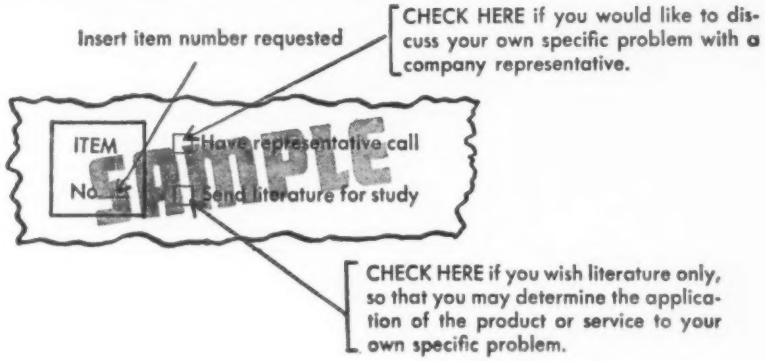
20. Plastic catalog

Republic's new X-Tru-Coat plastic-coated steel pipe and tubing are described in a newly published folder. The four-page folder describes the problems of pipeline corrosion, and shows how the strength

FOR MORE INFORMATION...
on New Products and Trade Literature

...use these SPECIALIZED READER SERVICE CARDS

They are designed to SAVE TIME and give you BETTER SERVICE on your inquiries.


Insert item number requested
CHECK HERE if you would like to discuss your own specific problem with a company representative.
ITEM No.
SAMPLE
Have representative call
Send literature for study
CHECK HERE if you wish literature only, so that you may determine the application of the product or service to your own specific problem.

Postage Will Be Paid by Addressee

No Postage Stamp Necessary If Mailed in the United States

BUSINESS REPLY CARD

First Class Permit No. 6955, Sec. 34.9 P. L. & R., Los Angeles, California

GAS **magazine**
READER SERVICE DEPT.
198 SOUTH ALVARADO ST.
LOS ANGELES 57, CALIF.

Please send me further information on GAS DIGEST items listed below.

ITEM No.___ ☐ Have representative call ☐ Send literature for study	ITEM No.___ ☐ Have representative call ☐ Send literature for study
ITEM No.___ ☐ Have representative call ☐ Send literature for study	ITEM No.___ ☐ Have representative call ☐ Send literature for study
ITEM No.___ ☐ Have representative call ☐ Send literature for study	ITEM No.___ ☐ Have representative call ☐ Send literature for study

Please print.

NAME_____ TITLE_____

COMPANY_____

ADDRESS_____

May, 1957 **Void after 90 days**

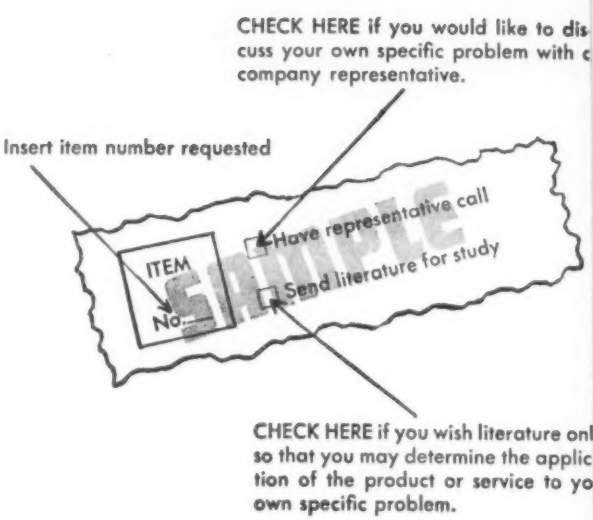
Important!

ote how these Reader Serv- Cards are *Specialized* so at you may . . .

- Request a company representative to call to discuss your own specific problem, or . . .
- Request data only, to study the application of the product or service to your own specific needs before talking with a company representative.

Keep up with what's new in Products and Services

Make use of GAS Magazine's Specialized Reader Service Cards


CHECK HERE if you would like to dis
cuss your own specific problem with c
company representative.
Insert item number requested
ITEM
No.
SAMPLE
Have representative call
Send literature for study
CHECK HERE if you wish literature onl
so that you may determine the applic
tion of the product or service to yo
own specific problem.

Please send me further information on GAS DIGEST items listed below.

ITEM No.___ ☐ Have representative call ☐ Send literature for study	ITEM No.___ ☐ Have representative call ☐ Send literature for study
ITEM No.___ ☐ Have representative call ☐ Send literature for study	ITEM No.___ ☐ Have representative call ☐ Send literature for study
ITEM No.___ ☐ Have representative call ☐ Send literature for study	ITEM No.___ ☐ Have representative call ☐ Send literature for study

Please print.

NAME_____ TITLE_____

COMPANY_____

ADDRESS_____

May, 1957 **Void after 90 days**

Postage Will Be Paid by Addressee

No Postage Stamp Necessary If Mailed in the United States

BUSINESS REPLY CARD

First Class Permit No. 6955, Sec. 34.9 P. L. & R., Los Angeles, California

GAS **magazine**

READER SERVICE DEPT.

198 SOUTH ALVARADO ST.

LOS ANGELES 57, CALIF.

Important!

Note how these Reader Ser
ice Cards are *Specialized*
that you may . . .

☑ Request a company repr
sentative to call to discu
your own specific proble
or . . .

☑ Request data only, to stu
the application of the pro
uct or service to your ow
specific needs before tal
ing with a company repr
sentative.

of steel and the protection of plastics have been combined in a product to meet the requirements of the most severe corrosive applications.
Republic Steel Corp.

21. Regulator bulletin

Revised size, capacity and weight tables of Rockwell "120" sensitive regulators are included in a newly revised four-page bulletin (No. 1044, Rev. 6). Revision was necessary because of the doubling of the maximum inlet pressure of the regulator. Capacity tables make allowance for the fact that capacity is no longer limited to the amount of gas passed at a 1-psi inlet-outlet differential. Differentials up to 10 psi may now be used provided the control tube is taken downstream.
Rockwell Manufacturing Co.

22. School brochure

A four-page brochure from A. Y. McDonald describes that company's pump application and engineering service school. The program consists of four days of intensive instruction. Various phases of pump engineering, application, installation, and service are covered. Special emphasis is on basic pump principles, pump selection, proper installation, pump service, and service department management.
A. Y. McDonald Mfg. Co.

23. Range catalog

Florence Stove Co.'s 1957 line of gas ranges is described in a completely new 60-page illustrated catalog. A 14-page illustrated section describes in detail all Florence "Years Ahead" features with the balance of the catalog showing the entire '57 line. Complete data, specifications, etc., are included.
Florence Stove Co.

24. Condenser catalog

Rockwell meters, regulators and valves are covered in a completely revised, condensed 28-page catalog (C-5000, Rev. 8). Outstanding new features of the catalog include photo-illustrated descriptions of the new Rockwell telapilot—with power pilot loading by remote control—and the Hypregun, a new air-operating valve lubricant gun.
Rockwell Manufacturing Co.

25. Control bulletin

Illustrated literature is available from Grayson Control on its new home heating control. Model HC-E is a high-capacity control featuring noiseless operation. A new electric actuator replaces the solenoid, and insures, quiet, dependable operation.
Grayson Controls Division

26. Lining report

A comprehensive report on protective linings and coatings is presented in a new booklet from the Protective Coatings division of Metalweld Inc. The brochure discusses types of protective linings and coatings, why they are important, and when and how they should be applied.
Metalweld Inc.

27. Research bulletin

"An Approach to Interpretive Research" is a bulletin describing lab facilities at Selas Corp. which are available for contract research to private companies as well as to trade organizations, government agencies, and other organizations. Investigations that bridge the gap between basic theory and practical application are described. Selas Corp.'s facilities are well illustrated in the 24-page bulletin (S-1053).
Selas Corp. of America

28. Water heater catalog

Specifications of 17 models of commercial gas water heaters are detailed in a new eight-page combination catalog and self-mailer from Ruud Manufacturing Co. The catalog covers commercial units in the three use classifications of the AGA: automatic storage gas water heaters, circulating tank gas water heaters, and instantaneous gas water heaters. Sizing tables show Btu input, hot water delivery at graduated temperature rises, and installation space requirements.
Ruud Manufacturing Co.

29. Gas mixing book

"Controlled Mixing of Gas" by C. W. Warner covers gas mixing fundamentals, typical gas mixing control systems, proportional peak shaving and standby control, and gas jet compressor mixing control. Mr. Warner is development supervisor of Cutler-Hammer's gas industry control division. The 74-page booklet is divided into four sections. Each section contains detailed descriptions of the systems reviewed, plus schematic flow diagrams, installation photos, performance charts, design and operating curves, and information covering general gas mixing problems.
Cutler-Hammer Inc.

30. CO Analyzer folder

Continuous carbon monoxide analyzers, adaptable to any set of individual requirements, are described in a four-page folder from Mine Safety Appliances. The MSA analyzers, which detect the accumulation of dangerous gas concentrations, are specially effective in metallurgical plants, vehicular tunnels and garages, coke oven and gas manufacturing plants, test chambers, heat treating operations, and chemical processes.
Mine Safety Appliances

31. Pilot valve catalog

Spring-loaded, diaphragm-actuated hydraulic pilot valves from Atlas Valve Co. are described in a new catalog sheet. The two-color publication contains photographs, cutaway diagrams, valve features and recommended applications and specification instructions.
Atlas Valve Co.

32. Marking catalog

How to select self-adhesive pipe marking material is discussed in a new eight-page catalog from Printed Cellophane Tape Co. More than 500 self-adhesive vinyl plastic pipe markers are listed.
Printed Cellophane Tape Co.

33. Coating catalog

Nature of corrosion and its control are covered in a new 25-page booklet from Polyken. The two-color catalog is completely illustrated with photos and drawings showing Polyken protective coatings in action. The tape method of application to pipe is fully explained. Case histories of successful applications of the Polyken method are cited.
Polyken Sales Division

THE ONLY
ENGINEERING
SERVICE for
GAS LEAKAGE PROBLEMS

GAS LEAKS LOCATED and PINPOINTED with ECONOMY

SIMPLIFY your "nuisance" problems by hiring an engineering service to solve your engineering problems.

WRITE TODAY for information regarding your leasing of a two-man leakage-detection unit complete with vehicle, radio communications, mounted compressor, and the latest gas detection instrumentation. Our services include:

GAS LEAKAGE CONTROL SURVEYS
COMMERCIAL & INDUSTRIAL AREA SURVEYS
CORROSION CONTROL SURVEYS
AERIAL PIPELINE PATROL

Contact: GAS ENGINEERING DIVISION

NEW ENGLAND FORESTRY SERVICE, Inc.
281 Main St. Reading, Mass.
J. E. B. GIBBONS, *Special Rep.* 44 Abbott Rd., Bradford, Pa.

Originator of Vegetation Surveys for Gas Companies in 1934

WARRENGAS *the Concentrated fuel*
GULF GULFTANE LP-GAS BUTANE PROPANE
WARREN
PETROLEUM CORPORATION
LIQUEFIED PETROLEUM GAS DIVISION
TULSA, OKLAHOMA
SALES OFFICES:
FORT WORTH, TEXAS
HOUSTON, TEXAS
LOUISVILLE, KENTUCKY
MADISON, WISCONSIN
MIDLAND, TEXAS
JACKSON, MISSISSIPPI
ST. LOUIS, MISSOURI
NEW YORK, NEW YORK
OMAHA, NEBRASKA
COLUMBIA, SOUTH CAROLINA
TAMPA, FLORIDA
SAN FRANCISCO, CALIFORNIA
BRYN MAWR, PENNSYLVANIA

for **leakproof, pressure-tight connections**
use TiteSeal®
SEALING COMPOUNDS
Heat and vibration-proof, non-solvent, will not shrink, crack or crumble. Makes all assemblies leak-proof and pressure-tight. Prevents rust, corrosion, joint seizure.
BRUSH-ON TiteSeal LIQUID TYPE WITH HARDENING GASKET & JOINT SEALING COMPOUND
7 BASIC BLENDS

LIQUID WRENCH®
The super-penetrating rust solvent
LOOSENS
rusted bolts, nuts, screws, 'frozen' parts
Liquid Wrench works *fast*... yet is absolutely safe for all metals and alloys.
DEODORIZED Liquid WRENCH "Works like Good Grease"
2171
At Industrial, Automotive, Hardware, Plumbing Jobbers
RADIATOR SPECIALTY CO.
Charlotte, North Carolina
SOLDER SEAL

associations • *Continued*

(*from page* 111)

grams between gas distribution companies and LPG dealers. He said:

"If the gas utility promotes only the benefits of city gas; and the LP boys hammer away only on the benefits of bottled gas, are they not, in effect, injecting negative connotations into their separate programs which were designed for positive consumer reaction?

"It is my observation that in too many locales, through the failure of the gas utility and LP gas dealer to get together, there is being created the illusion that there are two gas industries serving one general area. Proportionately, then, where this situation exists, the effectiveness of the advertising dollar is being diluted, and the local gas interests are sacrificing some measure of control of directing their own promotions. Moreover, they are committing an economic error by confusing the consumer.

"It is my observation that fast-growing Suburbia is becoming more and more electrically minded. Suburbia is comprised of the territories immediately surrounding every urban center of America.

"If the gas industry permits the suburbs to go electric, is it not true that city gas-served centers will find themselves boxed in, or ringed, by their major competitor? And, permitting that to happen, is it not true that the gas utilities will find themselves cut off from their natural avenues of expansion?

"From the LP dealers' viewpoint, does the new or prospective suburbanite know that all the conveniences of gas are available to him? Or, does he think that gas is strictly an urban fuel, and that LP gas is a fuel whose utility is limited to rural cooking?"

* * * * *

A better selling job can, and must, be done on gas ranges, Cecil M. Dunn, chairman of GAMA's domestic range division, reported to the NEGA.

"It appears to me that we must remain alert to the fact that every household task which gas performs can be accomplished by electricity. We in the gas industry know that our fuel and our products do these jobs better—but does the consumer know it? Or, has he been enamored by the

vastness of electrical promotions which tie in modernity, convenience and performance with push-button living?

"I submit, gentlemen, that if gas loses the fight for the kitchen load, gas industry prestige will suffer a severe blow. If the consumer is ultimately conditioned to the competitive concept that gas is outmoded in the kitchen, he'll eventually cast a questioning eye upon his heating system, his water heater and his laundry. . . .

". . . In 1956 . . . we sold only 2,179,000 gas ranges. That was only 61 per cent of our average annual potential. How about 1957? The average annual potential remains at the 3,591,500 units —but manufacturers expect sales to approximate only 2,227,000 units.

"That means, gentlemen, there is a market for 1,300,000 ranges more than the industry expects to sell. These are ranges which can be sold, but won't be sold, unless we cause them to be sold. In other words, we *can* sell three ranges for every two ranges we expect to sell."

* * * * *

Allen D. Schrodt, head of the gas industry's PAR plan, reported on some recent developments in research. He said:

"The entire area of gas utilization research is focussed upon making available as quickly as possible the means whereby gas appliances can be refined, improved, and upgraded. The most recent development along these lines is a new gas incinerator that is completely smokeless and odorless."

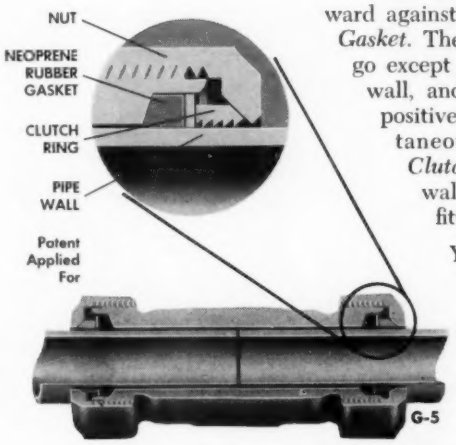
AGA President Clare Zachry took a look into the future, and came up with many optimistic observations. During his talk, titled "The Change and the Challenge," he observed:

"Our whole industry is on the move. If anyone has the slightest doubt of it, let's take a quick look at where we expect to be by 1965 —and that day will be here before we realize it.

"Net income of the gas utility and pipeline industry is expected to exceed $1 billion a year. That represents a 63 per cent gain over 1956 and a five-fold increase over our 1946 business.

"Already we are bringing the Blue Flame to more than 30 million customers; we passed that milestone in December. By 1965, we expect to be serving an average of 38.5 million customers a

Telsco
Compression Fittings
Seal Against
Gas Leaks



When you tighten up on the end nuts of a *Telsco Compression Fitting*, some interesting things happen inside the fitting. These are easily seen when you examine the cross sectional view at left.

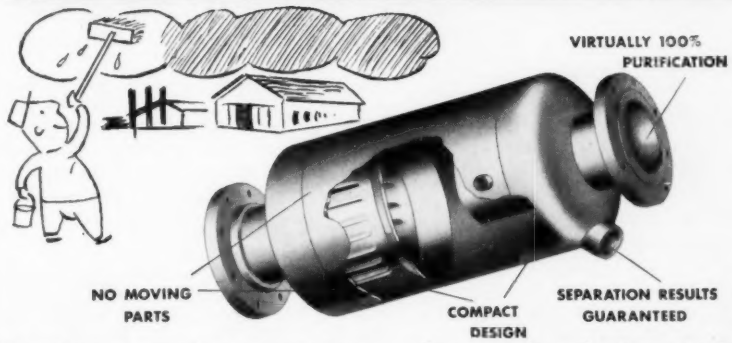
Tightening the end nut forces the unique *Clutch Ring* forward against the *Neoprene Rubber Gasket*. The gasket has no place to go except inward against the pipe wall, and this is what creates a positive seal against leaks. Simultaneously, the teeth of the *Clutch Ring* bite into the pipe wall, securely holding the fitting against stress.

You save time and labor, too, because *Telsco Compression Fittings* go right on plain end pipe, *without* threading or welding.

TELSCO FITTINGS DIVISION

5420 REDFIELD STREET DALLAS 35, TEXAS

SCRUB GAS
AT COMPRESSOR STATIONS
THIS MAINTENANCE-FREE WAY



The right way to scrub gas at compressor stations is to install patented Hi-eF Purifiers following interstage and afterstage coolers. These maintenance-free purifiers take out oil, dirt and moisture that damage compressors, controls, and valves. They have no moving parts, filters or screens, require absolutely no maintenance, and yet their efficiency is guaranteed!

FREE gas purification booklet

THE V. D. ANDERSON COMPANY
[illegible] Economy Corporation
9704 West 90th Street, Cleveland 2, Ohio
Please send your Bulletin on gas purification.
Name_____
Company_____
Address_____
City_____ Zone____ State_____

PURIFIERS • SCRUBBERS • SEPARATORS • MIST EXTRACTORS

OVER

650

GAS COMPANIES USE

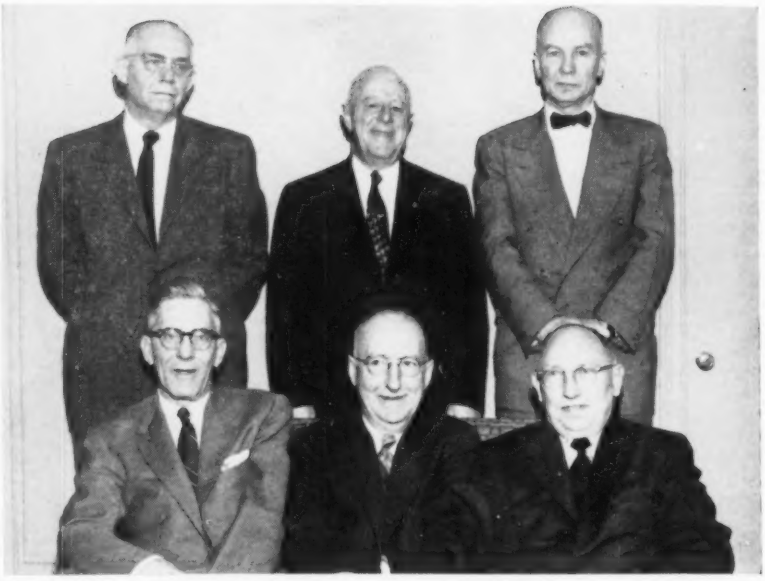
HEATH
Leakage Control Surveys

There can be no better testimony to the value of Heath Surveys which:

- *provide safety* by accurately locating gas leaks
- *conserve* natural resources
- *save* money previously recorded as unaccounted-for losses
- *speed* the efficient maintenance and repair of lines

Both large and small gas companies profit by using Heath Leakage Control Surveys. Write for complete information, at no obligation.

HEATH
Survey Consultants, Inc.
573 WASHINGTON ST., WELLESLEY 81, MASS.



New officers of the New England Gas Association for 1957-58 are shown here. They are: (lower row) G. R. Copeland, 2nd vice president; Otto Price, treasurer; Clark Belden, clerk. (Back row) E. G. Rhodes, president; Fred H. Faulstich, retiring president, and Andrew W. Johnston, 1st vice president.

year through nearly three-quarters of a million miles of pipelines.

"Total plant facilities and equipment, currently valued at $17.5 billion, will be more than doubled by 1965."

Mid-West group elects DeHaan to presidency

Peter C. DeHaan of the Iowa Power & Light Co. was installed as president of the Mid-West Gas Association at the organization's recent convention in Minneapolis.

Mr. DeHaan succeeds George B. Johnson, Minneapolis Gas Co., as president of the association.

Other new Mid-West officers include: Henry R. Slocum, Central Electric & Gas Co., first vice president; R. S. Stover, R. S. Stover Co., second vice president; and Everett E. Baxter, Central Electric & Gas Co., secretary-treasurer.

New officers of the Mid-West Gas Association are: P. C. DeHaan, president; R. S. Stover, second vice president; H. R. Slocum, first vice president, and Everett E. Baxter, secretary-treasurer.

AGA and PCGA join for transmission conference

The Pacific Coast Gas Association and the American Gas Asso-

The new A 850 BASO® SWITCH

The Baso No. A 850 switch-type automatic pilot is a new design of the reliable No. 850 for low and line voltage circuits and is thermocouple operated like its predecessor.

This new design offers:

- New straight line reset mechanism.
- New indicator button, bright red, to show when switch is ON or OFF.
- New cover, painted a soft gray to harmonize with appliance color schemes.

For more about this new switch, write

BASO INC.

MILWAUKEE 1, WISCONSIN
Dept. SC-3

(Formerly Milwaukee Gas Specialty Company)

Outsells . . . Outlasts . . . Outperforms . . .
ALL OTHERS!

NEW **AQUA** Water or gas

$29.50 F.O.B. Cin., Ohio
Your Name In Gold FREE!

VALVE BOX LOCATOR

One on EVERY SERVICE CAR!

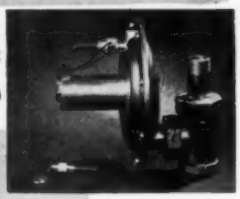
- NATION'S MOST WIDELY USED LOCATOR!
- NO WIRES, BATTERIES or SWITCHES simple, powerful magnetic action, factory adjusted for YOUR geographical location.
- NO NEEDLE SPINNING—exclusive electric braking action.
- TOP VIEW READING—No stooping.
- RUGGED, COMPACT, ACCURATE, CONVENIENT!
- GUARANTEED—to function regardless of surface or ground cover.
- 15-DAY FREE TRIAL—No money! No obligation! You be the judge!

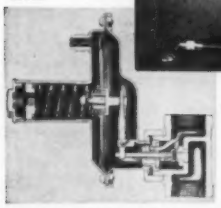
ORDER NOW—Wire or Call Collect for fastest delivery! PHONE: Kirby 1-4200

AQUA SURVEY & INSTRUMENT CO.
2016 Leslie Ave., Cincinnati 12, Ohio

UNIVERSAL
GAS SERVICE REGULATORS FOR CONVERSION OR PRESSURE ELEVATION

A REGULATOR, BREATHER VENT AND CATHODIC INSULATOR IN ONE PACKAGED UNIT





U. S. Patent No. 2,577,480. Other Patents Pending.

TYPE 51-R FOR EVERY INSTALLATION

EXCLUSIVE FEATURES NOT FOUND ELSEWHERE!

Exceptionally high relieving capacity obtained by new type internal relief valve. Remarkable by-pass check valve prevents over-shooting of low pressure and damage to meter.

SEND FOR BULLETIN NO. 521

UNIVERSAL
CONTROLS CORPORATION
P. O. BOX 13122 WALNUT HILL STA.
DALLAS 20, TEXAS

associations • *Continued*

ciation are joining forces for the annual transmission conference, slated for San Francisco, May 8-10.

The multi-sponsors of the meeting are the technical section of the PCGA and the communications, gas dispatching, gas measurement, transmission and underground storage committees of the AGA's operating section. Sessions will be held in the Mark Hopkins hotel, high atop San Francisco's Nob Hill.

General sessions will be held on Wednesday, Thursday, and Friday mornings.

The first general session, presided over by H. F. Steen, chairman of the AGA transmission committee, will feature reports on "Pulsation Research Program at Southwest Research Institute" by Ralph Bain, Arkansas Louisiana Gas Co.; "Recent Developments in Gas Measurement" by James L. Griffin, Northern Natural Gas Co.; and "Communications as a Part of Systems Operation" by Dwight B. Sprow, Natural Gas Pipeline Co. of America.

Thursday morning's general session will feature Graham B. Moody, consulting petroleum geologist, discussing natural gas developments in western United States, Mexico, and Canada. He will be followed by R. W. Newby, Southern California Gas Co., discussing "Integrating Gas Odorizers."

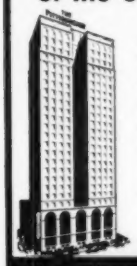
Various phases of underground storage will highlight the last general session on Friday morning. In addition, Dr. Robert C. McMaster, Ohio State University, will speak on "Non-Destructive Inspection of Pipe Girth Welds" and Warren S. Hyde, Pacific Gas & Electric Co., will discuss "Safety—As Practiced by Pacific Coast Utilities."

Afternoon sessions, which will begin with luncheon meetings and continue throughout the afternoon, will touch a wide variety of subjects.

Wednesday afternoon will have sessions on communications, compressor stations, gas measurement, and pipelines. Compressor stations and pipelines will repeat again on Thursday, with the addition of gas dispatching and underground storage sessions.

Hotel PITTSBURGHER
PITTSBURGH, PA.

Right in the heart of the Golden Triangle



400 outside rooms with bath. Large-screen television and radio at no extra charge in every room. Air conditioning. Finest dining room.

ATlantic 1-6970

Handiest Locations in PITTSBURGH

Hotel Pittsburgher MOTEL

Opposite Greater Pittsburgh Airport on Airport Parkway west. 56 air-conditioned rooms with large-screen television at no extra charge. Tile bath. Private phone. Restaurant facilities. Courtesy car to and from airport.

AMherst 4-5152

Joseph F. Duddy, Gen. Mgr.

KNOTT HOTELS

The R. W. STAFFORD CO.
GAS CONSULTANTS—ENGINEERS—CONSTRUCTORS
Natural Gas Conversions
Plant Management and Operation
Peak Shaving and Standby Plants
Accident and Insurance Investigations
EVANSTON, ILLINOIS
2944 Grant St. — Phone UNiversity 4-6190

FOR SALE

35 #4½ Emco gas meters—good condition—low mileage. F.O.B. Brooklyn, N. Y.

Contact: Miss Meany, Purchasing Agent
BROOKLYN BOROUGH GAS CO.
817 Neptune Avenue, Brooklyn 24, N. Y.

SITUATION WANTED

General or Operations Manager available with 27 years' experience in all phases of natural gas business. Available immediately. Age: 48—married. Further details on request. GAS, Box 571, 198 S. Alvarado St., Los Angeles 57, Calif.

PEP campaign awards made at industrial conference

Awards were presented to the winners of the 1956 PEP campaign at the industrial and commercial gas conference in New Orleans.

Winning companies in their respective classes who made the best showings in sales of heavy duty commercial cooking equipment were: Laclede Gas Co., St. Louis,

a second-time winner in the 100,000-and-more meter group; Piedmont Natural Gas Co., Charlotte, N. C., fourth-time winner in the 25,000-to-100,000-meter group; and Worcester (Mass.) Gas Light Co., in the less-than-25,000 group.

Symposiums highlight production conference

Bal Harbor, Fla., will be the scene of the AGA production conference, May 20-22.

One of the highlights of the conference, meeting in the Balmoral hotel, will be a symposium on the role of gaseous fuels in the nation's energy picture. Another symposium on the manufactured gas production planning program will cover alternate methods for meeting peak demands.

The usual pattern will be followed at the conference with general sessions on the first two morning and afternoon sessions beginning with luncheon.

Topics to be covered at general sessions include safety, research, odorization, air pollution, and oil gas production.

Other meetings will be held on manufactured gas production planning, research, gases from fluid fuels, chemical engineering in the gas industry, and quality control-odorization-gas conditioning.

The chemical and engineering session, presided over by George G. Dormer, vice chairman of the committee, will convene on Wednesday morning. Simultaneously, Hugh T. Maloney will preside over the manufactured gas production session.

GAS association notes

Dura-Vent Corp. and Pate Co. Inc. are new members of GAMA. Dura-Vent, with headquarters in Redwood City, Calif., manufactures gas vent pipes. Pate Co., Louisville, Ky., makes complete boiler-burner units.

Frank Wise has joined the AGA as assistant to Curtis Morris, manager of the Washington, D. C., office. A trade association officer for more than 20 years, Mr. Wise most recently served as executive secretary of the Trade Associations Coordinating Committee on Government Competition.

Another ALGAS
LP-GAS PLANT FOR UTILITY USE
20,000 Gallon Storage Plant Provides Gas Service For Many Homes Beyond Existing Gas Mains

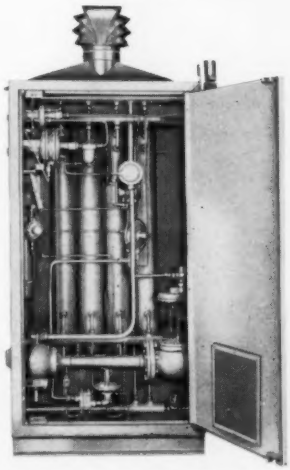
ALGAS SUPPLIES COMPLETE LP-GAS SERVICE FOR ALL GAS INDUSTRY REQUIREMENTS

ALGAS
LP Gas Carburetion & Gas Plant Equipment
Established 1932

For general utility service, peak-load shaving, or stand-by use, ALGAS LP-Gas plants are widely used and universally recognized for their dependable and economical operation. Algas specializes in a close-knit service to the natural gas industry, providing complete engineering facilities for every kind of LP-Gas plant problem.

As the use of natural gas increases there are more applications for the use of LP-Gas either as supplemental service, for peak-load shaving, stand-by service to industry or for general utility service in areas beyond existing gas mains.

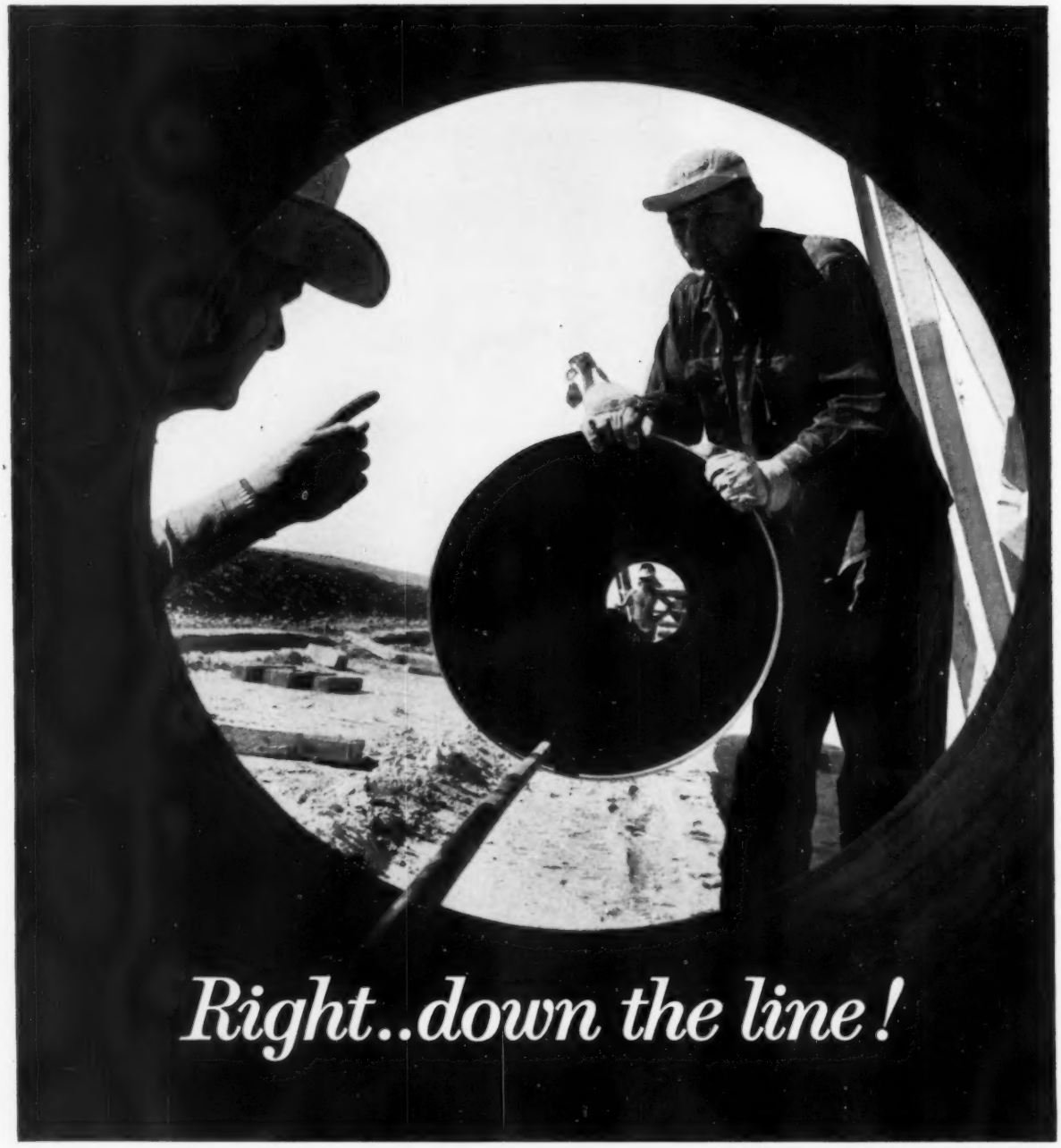
Whatever the need, ALGAS stands ready to work with utility gas companies in the solution of any specific problem involving the need of LP-Gas.



Self-Contained Packaged Gas Plants include Vaporizers, Vaporizer-Mixers or Mixers Only in Capacities from 2,500 to 50,000 Cubic Feet Per Hour. Unit Shown is 10,000 CFH.

Write today for complete information.

AMERICAN LIQUID GAS CORPORATION
1109 SANTA FE AVENUE • LOS ANGELES 21, CALIF.



PACIFIC NORTHWEST PIPELINE CORPORATION PHOTOGRAPH.

Quality, uniformity, precision—these are watchwords that you can always depend on when you use Kaiser Steel Line Pipe.

For example, Kaiser Steel Line Pipe—20 inch OD and larger—is placed in restraining dies and expanded by water under great pressure. This hydraulic expansion assures accurate diameter, concentricity and straightness—and also strengthens the pipe through additional cold working. Another example of the painstaking care that goes into the manufacture of pipe from Kaiser Steel.

Next time you are ordering line pipe, specify Kaiser Steel Line Pipe. Rely on Kaiser Steel quality and service to add dollars to your operating profits.

Kaiser Steel

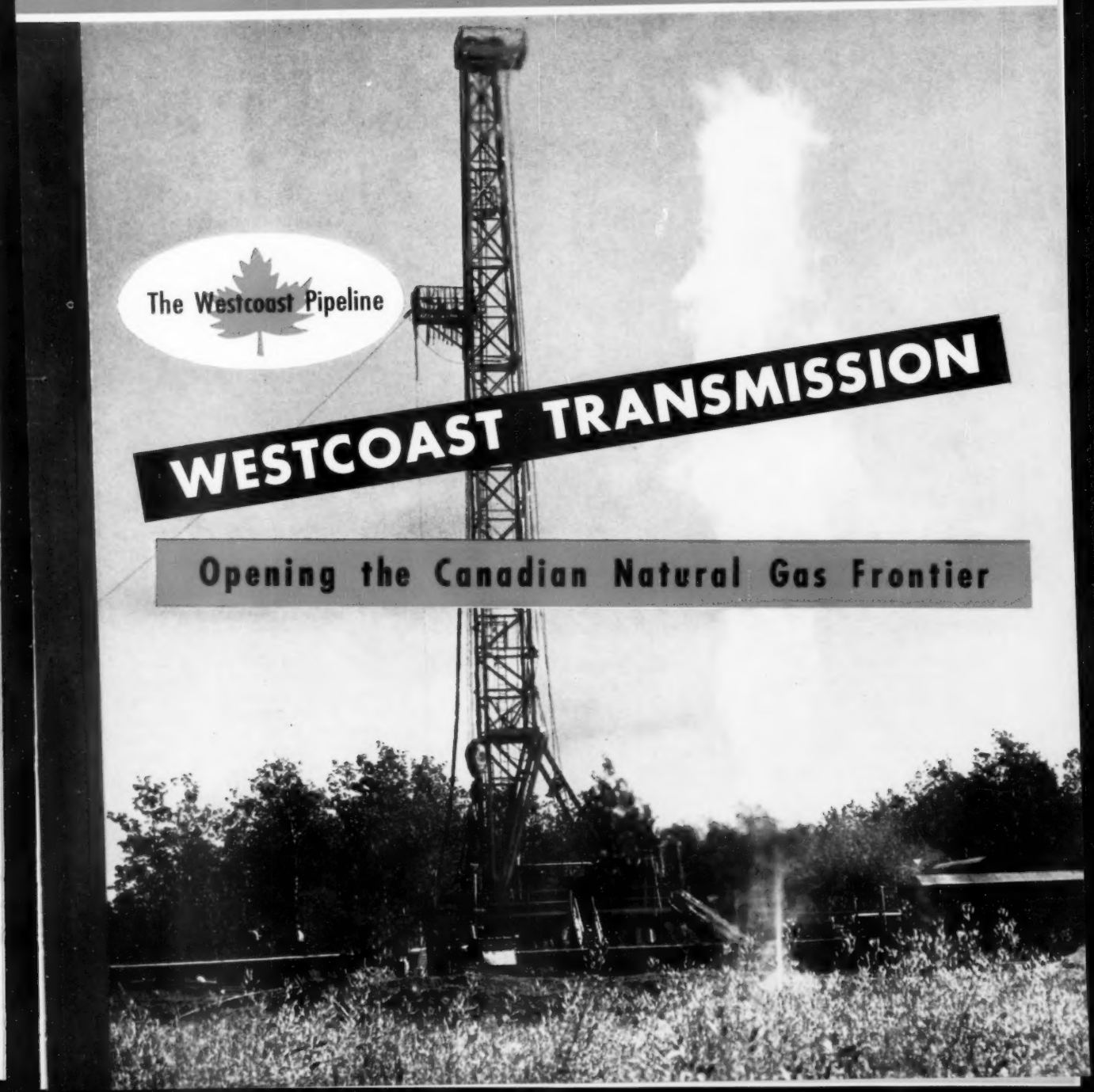
Steel Mill Products: plates • hot rolled strip and sheet • cold rolled strip and sheet • tin plate • continuous weld pipe • electric weld pipe • alloy and carbon bars • bar shapes • structural shapes • semi-finished steels • pig iron • ingot molds • coke by-products • **Fabricating Division:** steel fabrication for construction, aircraft, missile and other industries • expanded fusion weld pipe • reinforced concrete pipe • tanks • For specifications, write: **KAISER STEEL CORPORATION** • **Los Angeles** • **Oakland** • **Seattle** • **Portland** • **Phoenix** • **Denver** • **Tulsa** • **New York**

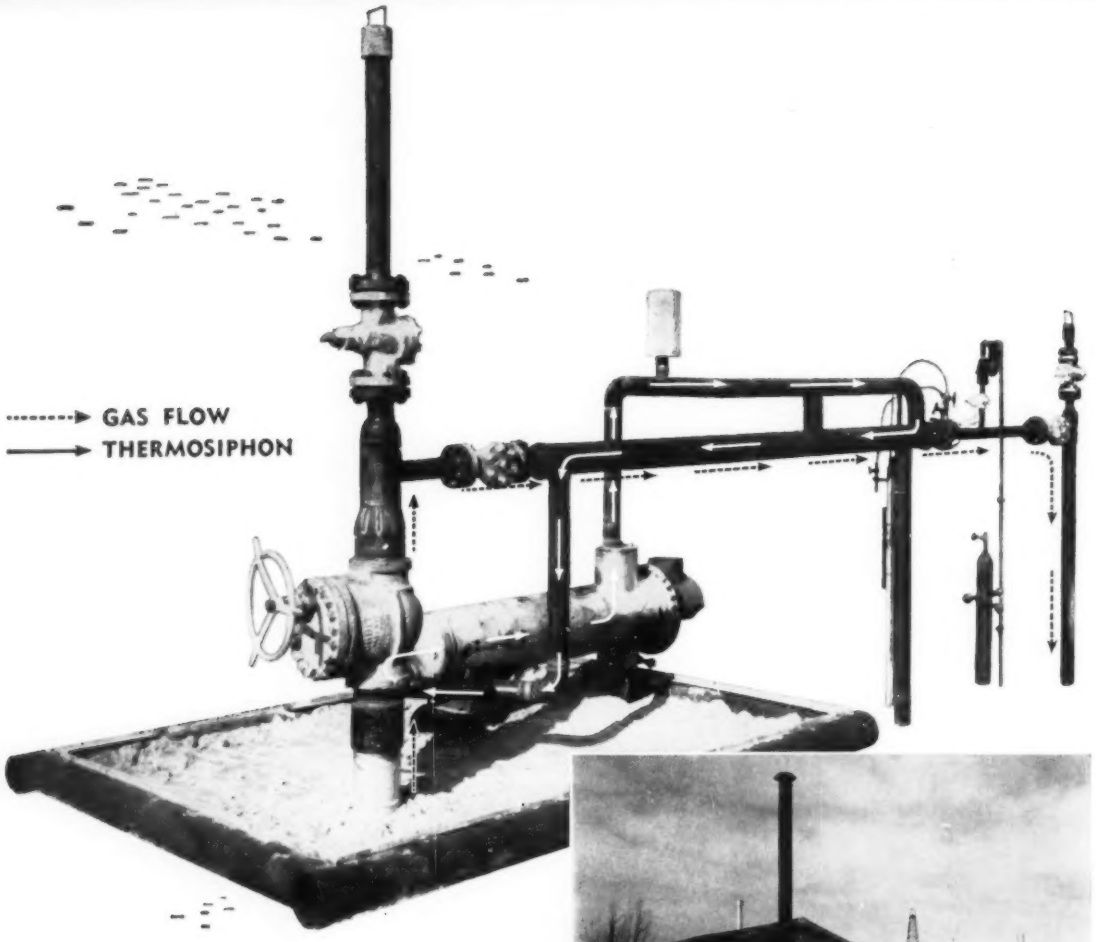
TRANSMISSION • STORAGE • CONDITIONING

GAS

PIPELINE SECTION

ENGINEERING • CONSTRUCTION • MAINTENANCE





GAS UTILITY USES 225 NATIONAL HEATERS... SAVES $900 PER MONTH

SITUATION — Underground natural gas storage area in Central Michigan underlying 25 sections of land. Input pressures range from 307# psi to 700# psi. Gas is dehydrated before storage.

PROBLEM — To find a heater

1. That would give a 35 degree temperature rise to a gas stream whose maximum flow would be 500,000 cu/ft. per day.
2. That was small enough to fit in a small house covering both the wellhead and the heater.
3. That would operate at maximum efficiency since all gas consumed in the heater cost approximately 30 cents per thousand cu/ft. at the wellhead.

RESEARCH — Several types of "home-made" and commercial heaters were tried along with National's 16" x 6', Model CA124 Horizontal Heater.

RESULTS — By actual fuel consumption tests, using identical hook-ups, National's heater outperformed all others using exactly one half as much fuel as the competitive models. The gas utility shows a savings of $900.00 per month, based on a 12-month gas expense period. These savings are based on actual tests. They are effected by using 225 National 16" x 6' direct heaters — indirectly — in this one area.

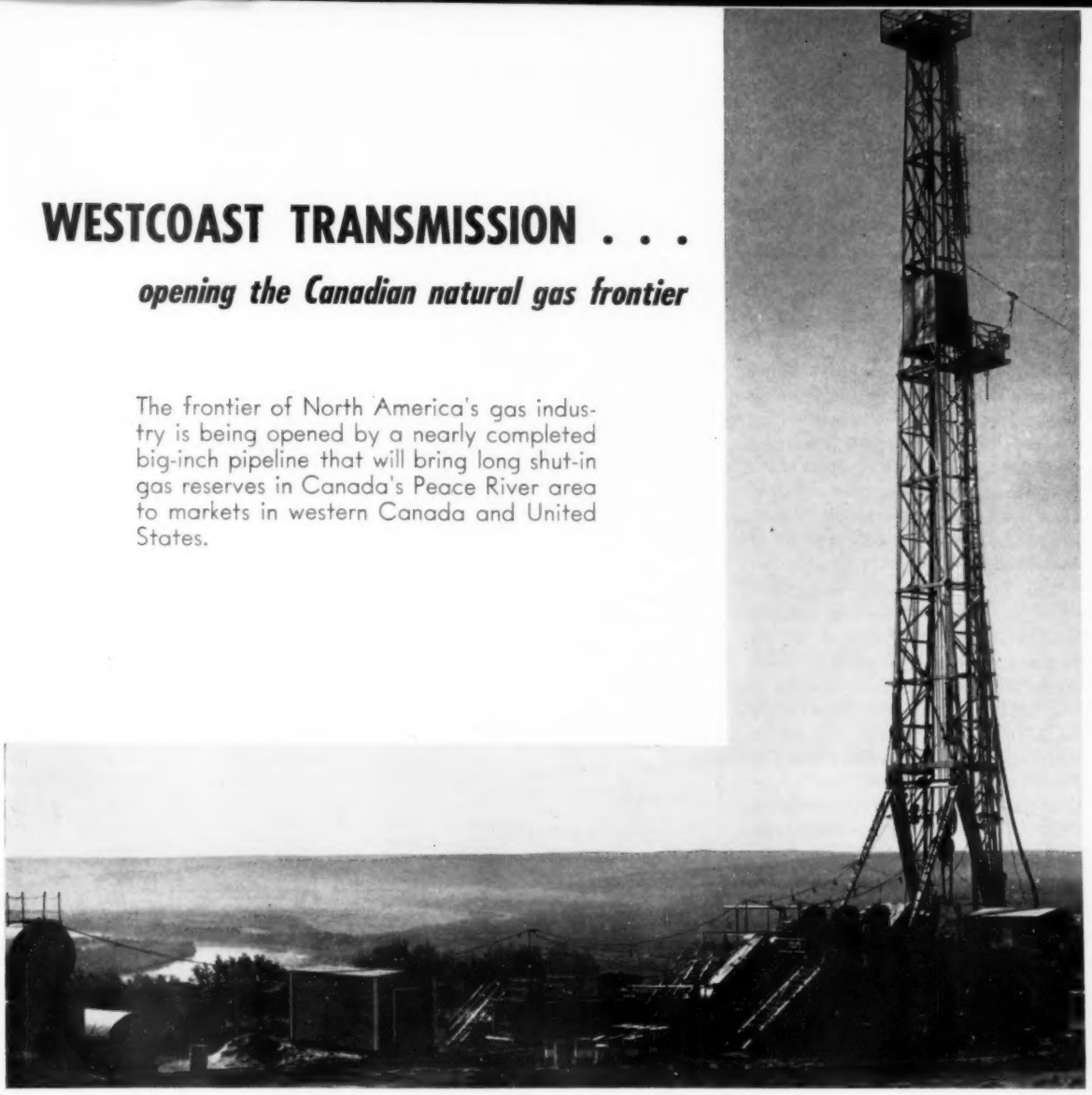
It's a National

NATIONAL TANK COMPANY

WESTCOAST TRANSMISSION . . .

opening the Canadian natural gas frontier

The frontier of North America's gas industry is being opened by a nearly completed big-inch pipeline that will bring long shut-in gas reserves in Canada's Peace River area to markets in western Canada and United States.



A Pacific Petroleums rig drilling in the prolific Peace River area.

GAS staff report

By J. FRED EBDON, Editor

THE Westcoast pipeline is a "natural." It is an awakening giant created by natural laws that defeat all the obstacles of man. The natural law involved states that: *When there is a tremendous market for natural gas in one spot, and this market is growing faster than are connected natural gas supplies, and at another location mighty gas reserves are shut-in, then a natural gas pipeline will soon be constructed to move this modern, convenient source of energy from one to the other.*

The huge shut-in reserves are up in Canada. They are in the Peace River fields of northeastern British Columbia and northwestern Alberta. Millions of years ago, a huge inland ocean reaching from the Caribbean to the Arctic deposited sediments in its basin as it departed. The United States tapped these strata for the oil and natural gas that have helped make her great. Now, the same sedimentary deposits are producing the dynamic development of gas in Canada.

Market for the natural gas is the Provinces of British Columbia and Alberta. Further market will be served in the United States' western states. Key to the development of "bonus" market for the Westcoast pipeline is California. Too, the Pacific Northwest states form a major market.

The Westcoast Pipeline

The gas reserves

THERE were 5 trillion cu ft of natural gas proven in Peace River fields two years ago, according to conservative estimates of the best geologists of both Canada and the United States. But, there have been many discoveries since then. When another assessment is made, the total will be many times 5 trillion.

The Peace river is a small part of Canada's northwestern natural gas, and oil, development. This immense district covers roughly 40-million acres in British Columbia, and another 30-million acres in Alberta. It extends far northward into the Yukon, then into the Northwest territories, and further northward to the Arctic ocean. Only very small areas have been explored for gas and oil. However, exploration and drilling have resulted in proving natural gas (and oil) reservoirs that are changing the agrarian economy of western Canada into a well-rounded industrial, inland empire.

The Peace River area was wildcatted in the 1920's by a subsidiary of the Imperial Oil Co. A discovery well (natural gas producer) was made in the Pouce Coupe field—astride the B. C.-Alberta boundary. Because of the remoteness of the area, it was a repetition of the often-heard story: no pipeline, can't get the gas to market.

Alberta province was the scene of the great Leduc discovery in 1947. Shortly thereafter, the Provincial Government opened northeastern British Columbia for exploration. This event was the turning point in the development of the province's natural gas and oil.

Peace River Natural Gas Co., an affiliate of Pacific Petroleums Limited, which also is the major participant in Westcoast Transmission Company Limited, secured the first three exploration permits. Sunray Oil Corp., Tulsa, (now Sunray-Midcontinent) participated with Peace River Gas and Pacific Petroleums. Phillips Petroleum (Oklahoma) was next in. Though these companies were in the exploration phase, Pacific Petroleums Limited alone pioneered and made the first important discoveries. Pacific Petroleums and Associates have continued to lead exploration and development throughout British Columbia.

Nineteen separate pay zones have been discovered in the Peace River area. Wells with three or four producing structures are not unusual. One well that was taken to the basement (bedrock) was found to have nine separate natural-gas pay zones—one producing horizon was tested to show production of more than 71 MMcf/day.

British Columbia has not been by itself in the development of natural gas reserves in western Canada. Intensive drilling has opened many new fields in the neighboring Province of Alberta (see map).

Western Canadian gas reserves stand at 5 trillion cu ft. Don't make a note of this figure. In the future, this volume will be insignificant. Remember, there are some 75 million acres of sediments. Practically every major (and many poorboy) producer in Canada, the United States, and many foreign countries, have been in on the play, but the area has just barely been scratched.

The area is not dependent on the richness of its oil and natural gas resources alone. Other mineral deposits, grains, timber, and additional resources, natural and manmade, add to the growth that has converted the Peace River area from the days of covered wagons and Indians to modern PTA groups and Cadillacs.

The Westcoast Transmission Company Limited (Vancouver, B. C.) is building the pipeline that will tap the prolific gas producing fields of the Peace river in British Columbia and Alberta. It will deliver gas to the growing population of major sections of western Canada. In addition, it will deliver gas to western United States. The latter deliveries will enable Canadian customers to receive natural gas service at a much more economical rate than would have been possible if the big-inch pipeline was restricted from these U. S. sales. Advantages thereby accrue to both great sister nations on the North American continent.

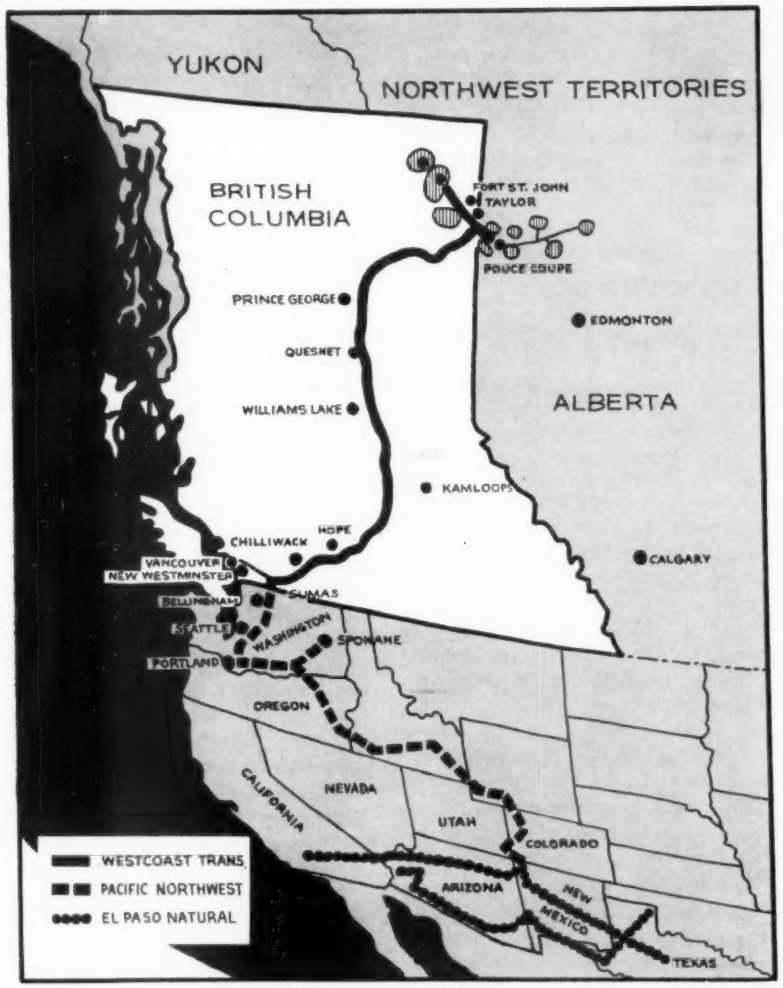
A pipeline is born

REGARDLESS of recent misinformation on the origination of the idea for building a pipeline to bring natural gas to British Columbia and the Pacific Northwest section of the United States, full credit belongs to a group of native British Columbians—championed by the leadership of Frank McMahon and his brother George. The Westcoast line was actually spawned in 1935 by forward-thinking Frank McMahon, president of Westcoast Transmission and chairman-of-the-board of Pacific Petroleums.

He, and his associates, initiated engineering studies and market potential evaluation for the feasibility of transporting natural gas from British Columbia's prairies to B. C. and Pacific Northwest markets. It was a long, rough road between initial formation of the idea and the construction that is being pushed toward completion today. Almost as rough as the roads in some parts of the Peace River area.

The first step was to prove-up natural gas reserves in the Peace River fields. After 1947, a hurried, vigorous exploration program was set in motion. Haste was necessary because of plans being formed by American groups to "capture southern Alberta's growing natural gas reserves." The American financial interests had a gleam in their eyes for delivery of this gas to primarily American markets. Plans for sales in British Columbia were secondary and only a few sections of this province were to be served.

By contrast, Frank McMahon envisioned serving most populated areas within B. C. and original plans included a Westcoast Transmission lateral down into the United States to serve Seattle, Tacoma, and Portland. Another major lateral was to strike south-



Map of Westcoast pipeline, showing relationships with existing and proposed U. S. pipeline projects.

ward to Grand Coulee, Wash., and split to serve both Hanford and Spokane, Wash.

Before these plans could mature, there were several obstacles to be met. In 1949 the Pipeline Act was passed by Canada's Federal Government. This legislation made it necessary for any company desiring to transport natural gas in interprovincial or international trade to stand for federal incorporation.

The McMahons took their ideas and purposes to Ottawa to bid for the federal incorporation. Opposition was encountered. Powerful American interests and titans of Canadian trade and commerce brought pressure to bear in an attempt to forestall the plans of Westcoast Transmission. The fight was carried into Parliament. After lengthy debate, several efforts at filibuster, and meticulous study by members of the House of Commons, the incorporation was granted to Westcoast.

Further hearings and representations were conducted in the west. The legislature of British Columbia twice endorsed the Westcoast Transmission plans to bring the Peace River gas to market in the all-Canadian pipeline.

The next step was to obtain a permit for exporting natural gas from the Province of Alberta. After an additional three years of hearings, the Petroleum and Natural Gas Conservation Board, in Alberta, granted Westcoast a permit to export Alberta production down through British Columbia.

Although these challenges were successfully met, still others loomed in the future. Permits were necessary to build the pipeline (from the Board of Transport Commissioners in Ottawa) and to export sufficient volumes across the international boundary to make the project economically feasible (from the Department of Trade and Commerce).

Armed with a raft of documented permits, Westcoast figures took off for Washington, D. C. to obtain an FPC certificate to permit movement of Peace River gas into the United States. At this time, there were more or less competing plans by Pacific Northwest Pipeline Corp., Trans-Northwest Gas Inc., Northwest Natural Gas Co., Glacier Gas Co., and others, to line up projects with the markets of the Pacific northwest states as the prime objective (see GAS, October 1955, *THE SCENIC INCH*, pp 178-182). Some of these were directly concerned in moving Peace River gas into this tempting market. All were involved with this idea to greater or lesser extent. Intervenors arrived in droves and made this the most drawn-out series of hearings in FPC history; however, recent hearings promise to outtalk them for a new record. In June 1954, the FPC rejected the

Frank M. McMahon (right) had the idea and has furnished dynamic leadership to the Westcoast Transmission project. Here he is in the field with a son.

application of Westcoast Transmission. Pacific Northwest Pipeline Corp. received certificate for its fabulous *Scenic Inch* on June 18, 1954 as the culmination of this industrial battle.

The Federal Power Commission in rejecting the Westcoast plans had said:

(1) It objected to any section of the United States being solely dependent on a power resource from outside the United States. [A policy-setting statement that has since been reversed, in the case of Texas Eastern's importation of Mexican natural gas (See GAS, Dec. 1956, p. 126).]

(2) That Westcoast did not have firm contracts with companies planning to distribute Peace River gas in British Columbia and the state of Washington. Therefore, Westcoast did not have a case proving its line was economic.

(3) That there was a question in their minds about the continuity of service to the United States under the then existing Canadian statutes.

After considerable hard work, Westcoast signed firm gas-sales contracts with British Columbia Electric for delivery of gas in British Columbia, with Pacific Northwest Pipeline Corp. for sale of natural gas across the U. S.-Canadian border, and with Inland Natural Gas Co. for sale of gas into the Canadian territory. Then, Canadian statutes were revised to remove any doubt of discontinuity of service. Since then, these sales contracts (and others) have been increased substantially.

The basic design of the Westcoast pipeline was revised to provide for a big-inch line running from the Peace River area down to a connection with Pacific Northwest's *Scenic Inch* at the international boundary. With the FPC objections thus healed, the new plans and agreements were again passed on by the Board of Transport Commissioners and the Department of Trade and Commerce.

Westcoast was then ready for a second pass at the FPC. This time, they made it and on Nov. 25, 1955, FPC granted a certificate for the American importation on Canadian natural gas. At last, Westcoast was in business.

The contract between Pacific and Westcoast

THE Westcoast Transmission line cuts down through British Columbia to provide natural gas service to practically all populated areas of that province. It is the only pipeline company that proposed an all-Canadian route to serve British Columbia with natural gas produced in the province. These markets are relatively large, but it is questionable if the Westcoast Transmission line could be supported—in its present big-inch form—by this market alone. If it could, the unit price of gas to British Columbia customers would be much less favorable.

The contract with Pacific Northwest is key to the big-inch design, which affords capacity for expansion as the British Columbia and other Canadian provincial markets grow. In addition, this contract results in natural gas service to the Westcoast's Canadian service areas at a price that has caused other consumers to look northward with a bit of envy. But, it isn't Canada alone that benefits from the construction of Westcoast's line. The United States needs that Peace River Canadian gas.

The contract: Pacific Northwest Pipeline Corp. will take or pay for 300 MMcf/day at a 90 per cent load factor at the U. S. border near Huntingdon, about 40 miles east of Vancouver. Pacific Northwest, in turn, contracted with El Paso (Texas) Natural Gas Co. for certain deliveries.

Sunray Oil Corp. (now Sunray-Midcontinent) was involved through its holdings in Westcoast Transmission (23.75 per cent of the then outstanding shares) and Canadian gas production in the Peace River area.

The Westcoast-Pacific Northwest contract called for deliveries from Westcoast at the international boundary to start at 200 MMcf/day, prior to Jan. 1, 1958, and the 300 MMcf/day prior to Jan. 1, 1959. It was a 20-year agreement. Recently, the initial delivery was raised to 250 MMcf/day.

Pacific Northwest can reduce the delivery volume, after 60 days notice, by 50 MMcf/day until Jan. 1, 1960. Pacific can purchase an additional 100 MMcf/day from Westcoast when it is available and providing it is over and beyond Westcoast's contracts for service in Canada.

Pacific Northwest will pay Westcoast $0.2225/Mcf for Canadian gas delivered prior to Jan. 1, 1959. Thereafter, the price will be $0.2200/Mcf — firm, for 20 years. There are no escalation provisions.

Westcoast and Pacific Northwest have increased their original contract to provide for an additional 350 MMcf/day. This will be a north-to-south exchange, from Westcoast Transmission to Pacific Northwest. This volume is over and beyond the original 300 MMcf/day—for a total of 650 MMcf/day.

The original contract and subsequent ones call for further cooperation between Westcoast, Pacific Northwest and El Paso Natural. During 1957, Pacific Northwest will deliver 3.28 billion cu ft of natural gas to Westcoast for use in the distribution systems of B. C. Electric (Vancouver, B. C.) and other southern provincial markets. This delivery will be continued until the Westcoast line is placed in operation — by November 1957. Then, the flow will be reversed and the exchange will be from Westcoast to Pacific Northwest.

In the original agreements, Pacific was to deliver up to 50 MMcf/day to El Paso Natural, and had an option to deliver an additional 50 MMcf/day. El Paso will take title to this gas at the Canadian border and contracted to pay $0.03/Mcf over the cost of the Canadian gas to Pacific Northwest. The gas can be delivered at any point on the *Scenic Inch* designated by El Paso Natural. Actual delivery will be from the San Juan basin on a displacement basis.

The sale by Pacific Northwest of Westcoast gas to El Paso Natural will begin in 1958. Initial yearly delivery will be 16.6 billion cu ft in 1958; then, 33.2 billion in 1959 and thereafter.

Late in 1956, plans were announced whereby El Paso Natural proposed to acquire the stock of Pacific Northwest Pipeline Corp. Stockholders concerned have approved this plan. Pacific Northwest is the separate, operating subsidiary of El Paso and the two great pipeline systems (linked by Pacific Northwest to Westcoast) will be integrated. Obviously, this move points up anticipation of obtaining still larger deliveries of Peace River and other Canadian gas.

Also involved in the Pacific Northwest-El Paso consolidation plans is a 25 per cent interest in Westcoast Transmission Co. Ltd. held by a subsidiary of Pacific Northwest. When the merger plans are completed, El Paso will control Pacific and, therefore, hold a 25 per cent interest in Westcoast.

This three-party relationship will result in a partnership that will be beneficial to all three companies, and to the two great nations they represent.

Financing the Westcoast pipeline

TO finance the 650 miles of 30-in. and 38 miles of 26-in. mainline, plus other initial facilities such as 155 miles of smaller diameter gathering lines, four initial mainline compressor stations, and gas processing plants, Westcoast had to raise $170 million. Of this, $153 million were obtained in April 1956, and the further $17 million in December 1956. These funds were secured from private investors. Another example of the natural gas industry relying on the free-enterprise system.

Raising these moneys constituted the largest financing arrangement in Western Canadian history. Money flowed into the project from both Canada and the United States. Controlling interest is, and will remain, in the hands of Canadians. This is accomplished through the establishment of a Voting Trust Agreement.

About 64 per cent of the common stock of Westcoast will be under the control of six voting trustees. Four of the trustees are now and must remain Canadians. The other two represent the United States. Voting trustees representing Canada are: Frank M. McMahon, George L. McMahon, D. P. McDonald and Norman R. Whittall.

The representation from the United States are partners of Eastman Dillon, Union Securities & Co. (New York), Lloyd S. Gilmour and E. T. Herndon, whose firm had charge of the United States underwriting and has been an important backer of Westcoast and Pacific Petroleums since the early days in Peace River development.

Securities offered were:

First Mortgage Pipeline Bonds—$83 million: Prospective purchasers in Canada were offered these bonds prior to any foreign sale. Canadian insurance companies, pension funds, and banks took only $8.5 million of these bonds at the available rate of 4⅜ per cent interest.

Insurance companies (mainly) and others in the United States invested $74.5 million in the pipeline and the industrial future of western Canada. Two substantial investors, Metropolitan Life Insurance Co. and New York Life Insurance Co., do a large business in Canada and have made major financial investments in the development of Canadian industry.

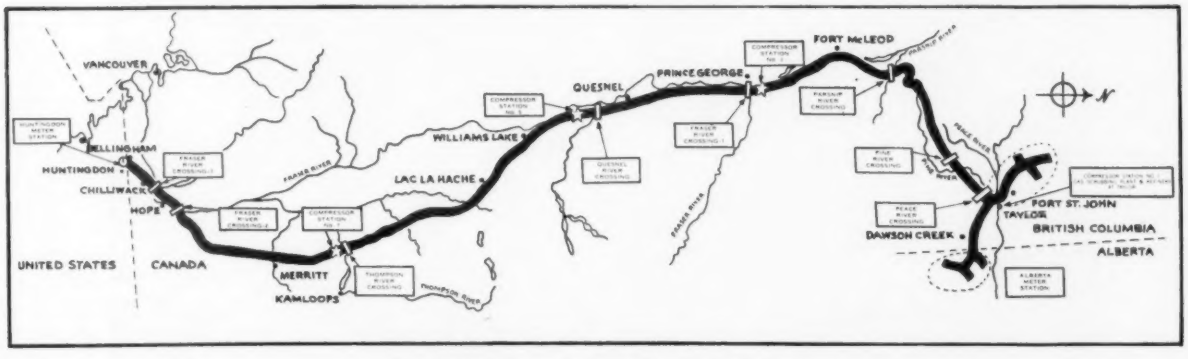
Debentures — $10.5 million: A Canadian bank subscribed for the entire block of this 3½ per cent issue.

Bank Notes — $19 million: The First National City Bank of New York, the Mellon National Bank and Trust Co. of Pittsburgh, and the National Bank of Commerce of Seattle provided this money on 3½ per cent notes.

Subordinate Debentures—$20.5 million: This was a public offering of units composed of debentures plus shares of stock. Canadians invested about $7 million in this issue.

Sales of Initial Shares of Stock —$16.35 million: This was an offering of capital stock without nominal or par value.

Since this initial financing, the entire pipeline project has been revised and it is planned to expand the physical system, install new compressor facilities, build new gas treating plants, tie-in new distribution systems, and tap new gas fields. The total cost of the line and associated facilities when the expansion takes place, would be $270 million.



The all-Canadian route of the Westcoast pipeline.

The Westcoast Pipeline

The pipeline route

THE general route of the Westcoast pipeline was selected after extensive aerial and ground survey. Emphasis was placed on selecting right-of-way in more accessible country where pipelining would be easier. Though some of the land that must be traversed is wild and mountainous, other parts along the route are swampy or semi-desert. Most of the route is thinly populated. In general, the route is not considered extremely rough in terms of modern pipeline equipment and technique.

Mainline MP/0 is at Taylor Flats on the Peace river. This point is near 120° latitude and 56° longitude. It's pretty far north from the United States' point of view, but is only about 400 miles south of the Yukon and Northwest Territories. From this mile post on the north side of the Peace river, the British Columbia gathering system follows the Alaska highway in a north northwest direction to across the Blueberry river. Stubs off of the prime gathering line pick up gas from fields in the Peace River trend.

A second gathering system, the Alberta, angles off from Taylor to the east southeast and crosses the British Columbia-Alberta border to gather gas from fields still in the Peace River trend, but in the province of Alberta.

The country north of the Peace river is generally rolling prairie. The land is used as a great grain-growing belt. Some brush is encountered and there are light stands of timber. Deep ravines cut through the area. As the line starts its southward trek, it crosses the Peace river on an overhead pipeline bridge and works out of the Peace River valley. The rolling terrain gives way to muskeg and swamp. Occasional floating bogs kept the construction spreads from going to sleep.

A submarine crossing of the Pine river is made at MP 32 as the 30-in. pipeline heads for Little Prairie just below a point where the adverturesome Pacific Great Eastern Railway forks on its journey northward. Little Prairie, at MP 50, is passed and the steel conduit parallels the railway and famous John Hart highway. All follow the meandering path of the Pine river to MP 75.

At MP 75 the pipeline starts an ascent along the Pine river to its headwaters in the summit of Pine Pass at 2900-ft elevation in the Rocky mountains. This part of the line, up to and beyond Azouzetta Lake, is in rough sidehill country. Rock crews find enough to keep them on their toes. There is heavy timber for the clearing gang to contend with. The transmission piping continues through pretty rough country, studded with heavy timber, as it snakes along the meandering Misinchinka river. The John Hart highway and the railroad keep the pipeline company until south of MP 125, where the railroad breaks away from its companions. The highway and the pipeline travel on together into MP 144. At this point the pipeline submarines the Parsnip river. The John Hart highway and the pipeline

Right-of-way cuts through dense forest in the Peace River valley.

Pipelayer-equipped tractor cradles 30-in. line pipe being inserted into casing at a road crossing in Pine Pass, B. C. This is the John Hart all-weather highway.

curve on into Ft. McLeod at MP 151.

The pipeline continues in a generally southerly direction toward Prince George. From the Parsnip south to Prince George, the pipeline stays with the highway. The PGE railroad rejoins them here at MP 175. The line follows along a crooked river system, penetrating densely forested lakelands. There are gravel and glacial till to trench through in this section. The dense forests of pine, fir, and tamarack make this a beautiful country, if not the best to pipeline through. The lusty Fraser river is encountered as the pipeline starts its pass to the east of Prince George. A suspension-type pipeline bridge (MP 225) takes the mainline over the river that has recorded scour 100 ft deep at the point of crossing.

The route straightens out as it travels with the Fraser river, running along its east slope. Communities with colorful names — Red Rock, Woodpecker, Cinema, Moose Heights—are passed. At MP 300, an overhead crossing of the Quesnel river is made as the route beats on to 150 Mile House (on the Cariboo highway No. 2), just north of MP 375 and near Williams lake. The Cariboo country is devoted to cattle ranching.

Between Prince George and Williams lake, dense timber is passed through. Rock and boulders dominate some sections. In other spots, the soil varies from bottom farm land to glaciated topsoil. Some creeks and canyons are traversed. These are very deep which make some unusually steep approaches.

The pipeline leaves the upper Fraser river valley at Williams lake and begins a climb to high plateau country. Along this section the boulders get larger, heavy timber is penetrated, and strata of rock outcrop. Some small streams and swampy pockets are passed through.

South of MP 400, 100 Mile House is passed. Here, the Cariboo highway No. 2 that the pipeline has followed from Prince George (where it parted with the John Hart highway), breaks away. From 100 Mile House the pipeline goes through some exceedingly unsettled territory. Access roads were non-existent. The spreads had to make their own. It is a truly remote, but ruggedly beautiful land. Just north of MP 450 the Bonaparte river is passed via a submerged crossing. This river has cut a very deep valley.

At Hihium lake the route reaches its maximum elevation in the high plateau country — 4250 ft. The right-of-way starts a gentle downward trend until about 15 to 20 miles north of Savona. There, the bottom drops out and the pipeline plunges from the high plateau into Deadman Creek canyon. In the canyon the soil is sandy with some rock outcrops. As the line works south, semi-arid type of country is encountered. Pools and pot-holes had to be conquered. Temperatures from 100 to 110° F are not unusual for this section.

At MP 483, practically in Savona, the Thompson river is crossed by a pipeline suspension bridge. The country becomes quite hilly south of Savona. Douglas fir and spruce trees grow to a diameter of 3 to 4 ft. Merritt is reached just below MP 525.

The Westcoast Pipeline

Trenching went along fast in this stretch with trenching machines making the 6-ft deep x 4-ft wide excavation in this fine-textured earth.

Coating and wrapping machine works through the lush Fraser Valley farm land in Schedule 4.

A minor crossing of the Nicola river is made immediately south of Merritt. Here, the route follows the Clearwater river up its valley to near headwater. The line goes up sharply into the Cascade range. Along the stretch, the Coquihalla river is crossed about 18 times in approximately 15 miles.

Boston Bar creek is picked up south of Coquihalla and Boston Bar pass is penetrated. The pipeline runs about 1500 ft above the stream at this point and is at 4700-ft elevation. Hope, at MP 600, is the next major community passed. This city is south of the Fraser river in its sea-level, rich bottom land. Entry is thus made to the main Fraser river valley.

A second crossing of the Fraser river is made at Flood (MP 602) just west of Hope. The Flood crossing is also on a suspension-type pipeline bridge. Between Hope and Flood there is very limited space in which to run the pipeline.

Westcoast built the pipeline on the north side of the Fraser river, to Ruby creek. A sharp jog takes the pipe around a huge rock point. Steep country is pipelined from Ruby creek. On into Seever island, there is quite a bit of rock that had to be blasted.

The pipeline "highway" passes into flat, brush covered land north of and past Agassiz. This type of terrain continues to the third crossing of the Fraser river at MP 622 near Rosedale. A 4000-ft highway bridge is used for this crossing. Between Rosedale and Huntingdon, the pipeline passes through very productive farm lands. This section has a high water table that presented a problem to the spreads.

The Westcoast pipeline terminates at MP 650 on the U. S.-Canada border near the towns of Huntington, B. C., Canada and Sumas, Wash., U. S. The line is physically connected to the *Scenic Inch* of Pacific Northwest Pipeline Corp. at this point.

The gas industry in the United States has wondered at the difficulties pipelining in the western section of Canada might produce. Unfortunately, we generally consider the terrain and climate of this part of our great neighbor to be unusually severe. This is not true in the case of the route selected for

the Westcoast pipeline. The climate, however, can be severe. Temperatures well below zero are not unusual. There are rugged mountains, etc., along the route, but most of these were avoided.

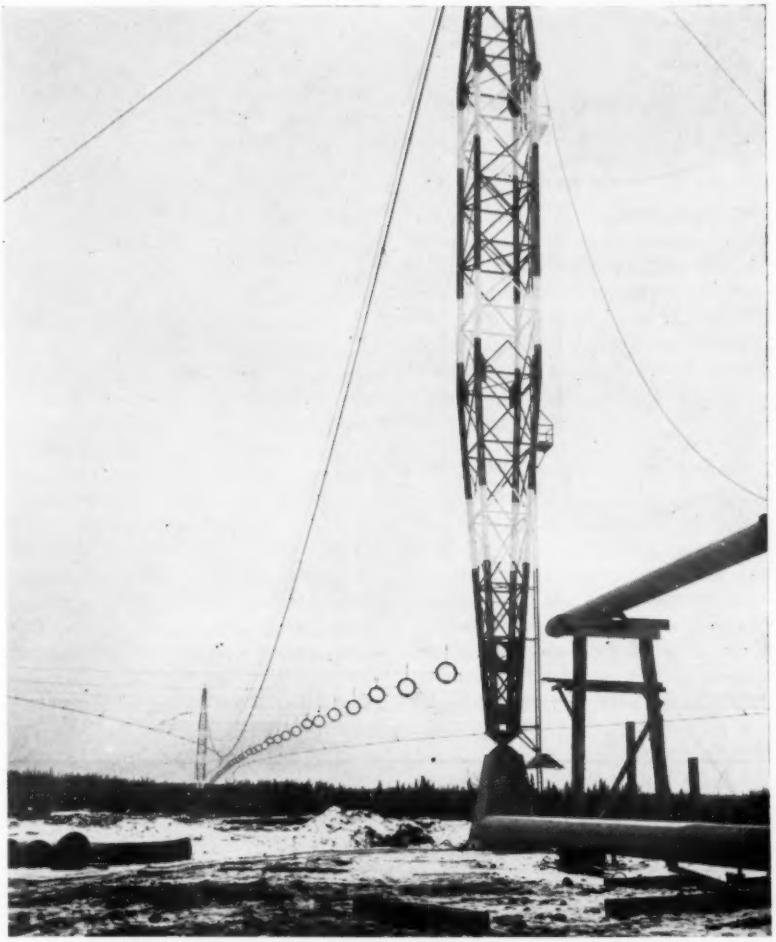
Actually, spread crews were able to clear and grub the year around. Trench work continued until rain and snow made it impractical. But, this came late in the year in 1956. It is estimated that complete pipeline work can start again in May 1957. Last year, unusually wet weather held some spreads in check until June.

Rainfall varies over the entire extension of the pipeline. In the Coquihalla canyon, north of Hope, rainfall was heavy during the early winter of 1956. In October and November of that year, for instance, about 0.5 in. per day was experienced. Rainfall will average about 12 in. per month in the coastal mountain regions. Just north of Savona, where the semi-desert land is hit, the rainfall has averaged only 10 in. per year over a 65-year period.

About 80 per cent of the route is forested. No merchantable timber was wasted. This resource was appraised by registered timber cruisers. Agreements were reached with property owners holding right-of-way land for the profitable disposition of the wood.

The route runs through 491 miles of Crown and Provincial lands. In addition, 1150 private land-owners had to be contacted and signed up for right-of-way. The route takes the pipeline through 159 miles of such land.

The line touches 15 Indian reservations. The land department had to work through the Department of Indian Affairs for clearance. Pow-wows with chiefs and councillors of Indian bands had to be arranged.



Suspension bridge design is unique. Note the radio-antenna-type tower with sway-brace cables tieing-in to deadman. Structural sway-brace arms are not used.

Construction

The design

THE Westcoast transmission line is designed to move 660 MMcf/day. However, under initial plans and financing, it was to be built and powered to transmit 400 MMcf/day. In early January 1957, the initial plans were revised to bring its operation up to its full capacity.

There will be 650 miles of 30-in. mainline pipe between Taylor Flats and the international border. Under the announced expansion plan, an additional 174 miles of 30-in. pipeline may be constructed from Alberta's Savanna Creek field to the International Boundary near Kingsgate, B. C., and Bonner's Ferry, Idaho. The new line is designed for peak day delivery of 125 MMcf.

Thirty-inch mainline pipe has an 0.375-in. wall thickness. This pipe was purchased to comply with specifications for High-Test Line Pipe, API std. 5LX, Grade X-52. It has a 30-in. outside diameter, 29.250-in. inside diameter, and weighs 118.65 lb/ft as delivered uncoated from the mills.

For river crossings, API 5XL-42 pipe with 0.500-in. wall thickness was used. Designers specified fully-killed (deoxidized) steel pipe material for any piping on the mainline that would be exposed to the atmosphere. Steel killed with both aluminum and silicon exhibits a fine grain structure that retains toughness of carbon steels at low temperatures.

In the Westcoast system there will be 155 miles of gathering systems lines ranging in diameter from 8 to 26 in. Plants for extracting liquids and processing natural gas will be tied-in with pipe in this category.

Initial horsepower designed into compressor stations was to be 52,-

The Westcoast Pipeline

500, in four stations. Complete design includes an eventual nine compressor stations with the full 185,000 hp which will move the 660 MMcf/day to markets. Of the four original compressor stations, one is powered with conventional reciprocating engine - compressor units. The other three have reciprocating gas engines driving centrifugal compressors through a speed increaser.

Maximum spacing for block valves is 20 miles. Most of them are at approximate 15-mile intervals except south of Hope where Class II construction is necessary. Eight- to 10-mile spacing is required in this section. The block valve assemblies are conventional design. Sales laterals will be tapped in at block valves where possible.

The first 150 miles of the mainline—between Taylor Flats and MP 150, near Ft. McLeod—is designed for pigging and will have full opening gate valves. Lubricated plug valves will be used for block installations south of this section. Recovery tubes are being used where lubricated plug valves are installed.

There are eight river crossings that are classed as major. Two of these are the submerged type, five are overhead crossings using suspension pipeline bridges, and one crosses a river on an existing highway bridge. In addition, there are 310 railroad and/or highway crossings and myriad minor water crossings.

There are two master measurement stations on the 650-mile mainline; one at either end. The northern meter station is at Taylor Flats where the British Columbia and Alberta gathering systems converge for tie-in with the mainline. The terminal-end meter station is at Huntingdon.

The Huntingdon meter station is unique in design. It provides measurement of gas flowing in either direction. This is necessary because of the contract by which the *Scenic Inch* pipeline will supply gas from the U. S. to southwestern British Columbia markets until the Westcoast Transmission pipeline is in operation. Then, the flow will be from Canada to the United States. Actually, the Huntingdon measurement point is two metering stations. Equipment is installed for metering gas delivered to B. C. Electric; the other for deliveries to Pacific Northwest Pipeline Corp.

Canadian Bechtel Ltd., Vancouver, B. C., is agent and managers of engineering and construction for Westcoast. Ford, Bacon and Davis (New York) is acting as consultant to Westcoast and is doing the detailed design of the compressor stations and meter stations.

Equipment is winched up 2000 ft of 40 per cent grade toward summit of Angle Peak—about 60 miles south of Merritt, B. C.

It got a bit chilly last fall near Hope, B. C. River-clamped 30-in. mainline pipe is lowered into the trench at a crossing on the Coquihalla river.

Construction operations

Aerial survey flights and ground location parties set out to select a most favorable right-of-way in January 1955. Pipe and equipment procurement was jumped into high-gear. Invitations to bid on spreadwork and other contracts were sent out.

Contracts were awarded to the following:

Schedule 1 — mainline between MP 0 (Taylor Flats) and MP 120 (Pine Pass): Dutton-Williams Brothers Ltd. Connected with this contract is work on two compressor stations.

Schedule 2—210 miles of 30-in. mainline between MP 120 (Pine Pass) and MP 330 (Marguerite): Canadian Bechtel Ltd., Construction Division.

Schedule 3—210 miles of 30-in. mainline between MP 330 (Marguerite) and MP 540 (Glen Walker): Conyes Construction Corp.

Schedule 4—110 miles of 30-in. mainline between MP 540 (Glen Walker) and MP 650 (Huntingdon): Mannix Ltd. (Subbed to Universal Pipelines Ltd., a subsidiary.)

Natural gas gathering system—155 miles of various sized lines around Ft. St. John and Dawson Creek: Canadian Rivers Ltd.

Compressor Station No. 1—Taylor Flats: Stearns-Roger Engineering Co. and Marwell Construction Co. Ltd.

Compressor Station No. 3—near Ft. McLeod: Stearns-Roger Engineering Co. and Dutton - Williams Brothers Ltd.

Compressor Station No. 5—near Quesnel: Stearns-Rogers Engineering Co. and Dutton - Williams Brothers Ltd.

Compressor Station No. 7 — Savona: Stearns - Roger Engineering Co. and Dutton-Williams Brothers Ltd.

Gas processing and refinery plants: Stearns-Roger Engineering Co. and Marwell Construction Co. Ltd.

Contractors began moving equipment to kickoff points in the autumn of 1955. Twenty miles of 30-in. OD pipe was obtained from Tennessee Gas Transmission Co. (Houston) in a trade-out. The spread contractors started clearing, grubbing, and grading. Mannix started building pipeline with the original 20 miles of pipe in the fall. However, they got just 7 miles in the ground before winter brought a quick halt to these operations.

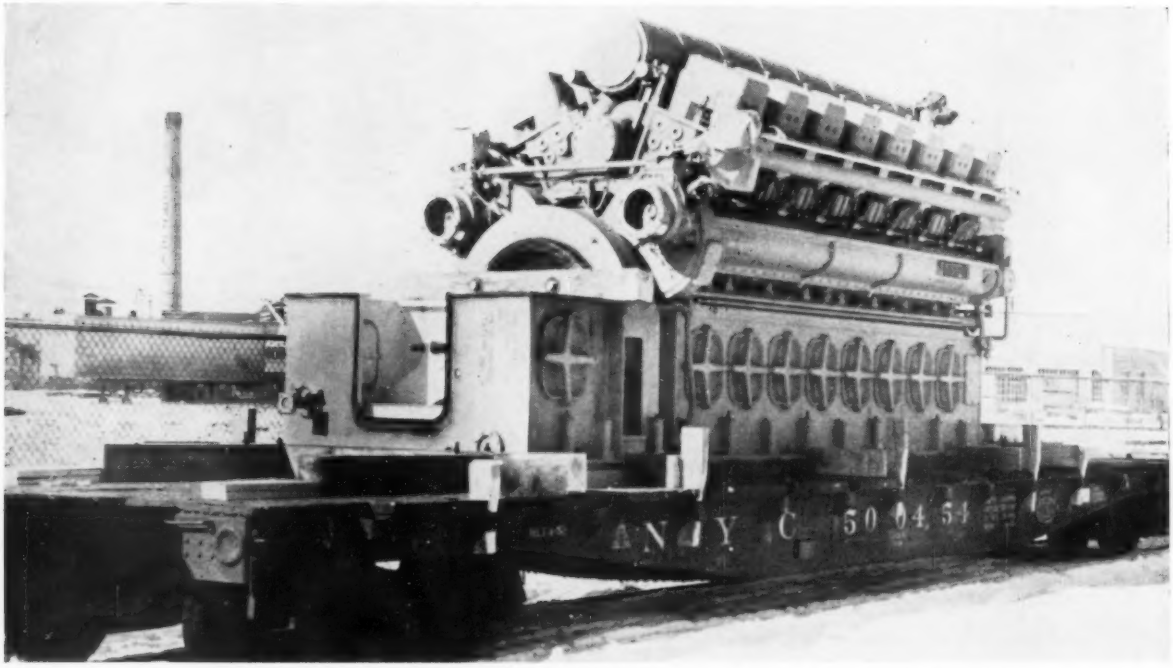
Work continued during the winter on the clearing project. Saleable timber was felled, slash burned, and graded. Track-type tractors and hand labor pushed the job through a "right rough" winter to prepare the 60-ft wide right-of-way.

Actually, the winter months of 1955-56 were used for preparation so that spreadwork could really roll with the spring thaw. Significant shipments of mainline pipe began to arrive in early 1956. This was stockpiled for the start of spreadwork.

The companies supplying the 650 miles of 30-in. pipe are: South Durham Iron and Steel Co. Ltd., Stockton-on-Tees, England; A. O. Smith Corp., Tubular Products Division, Milwaukee, Wis.; United States Steel Export Co., Consolidated Western Steel Division, Geneva, Utah; Colorado Fuel & Iron Corp., Claymont, Del.; Republic Steel Corp., Alabama City, Ala. Republic Steel supplied pipe in 31-ft nominal lengths, double jointed. The others delivered 40-ft nominal lengths.

History was made at Vancouver, B. C., when the first shipload of pipe from England arrived on Feb. 15, 1956. The S. S. Germa made the delivery from Middlesborough, England. The order, valued at $15 million, was the largest of its kind placed by a Canadian company with a United Kingdom firm.

The first shipment involved 1300 tons (585 40-ft lengths of 30-in.



Reciprocating gas engine that will drive centrifugal compressors through integral speed-increaser gearing. Eleven units will be used on Westcoast's current project. Eight of them will make the final leg of their trips on large flat-bed sleds, hauled over frozen ground.

The Westcoast Pipeline

pipe). This pipe was unloaded directly from the ship to flatcars on the pier. The flatcars were then switched to barges of the Pacific Great Eastern Railway for a 40-mile voyage to Squamish, southern terminal of the railroad. From there, a 395-mile rail run took special trains to Prince George. Trucks hauled the pipe the last 225 miles to stock-piling points.

When the spring thaw made its appearance in 1956, heavy rains set in. Work could not start until June. Contractors' schedules were disrupted, but they poured it on when they could get rolling.

Mannix (Schedule 4) ran into some trouble in the Fraser valley. The high water table compounded by the unusually wet spring weather meant pumping operations had to be started. In one section of the valley, they installed a pump for every 200 ft of trench. Water was moved out of the trench and dumped into nearby ditches and drainage canals. Five- and 10-in. pumps were used.

Another section on the Mannix spread (about 60 miles south of Merritt) got into high, rugged terrain that called for hanging equipment on cable from crawler tractors and winching them up the steep grades. They made pipeline up a 2000-ft, 40 per cent grade to Angle Peak; reputed to be a "pretty poisonous mountain."

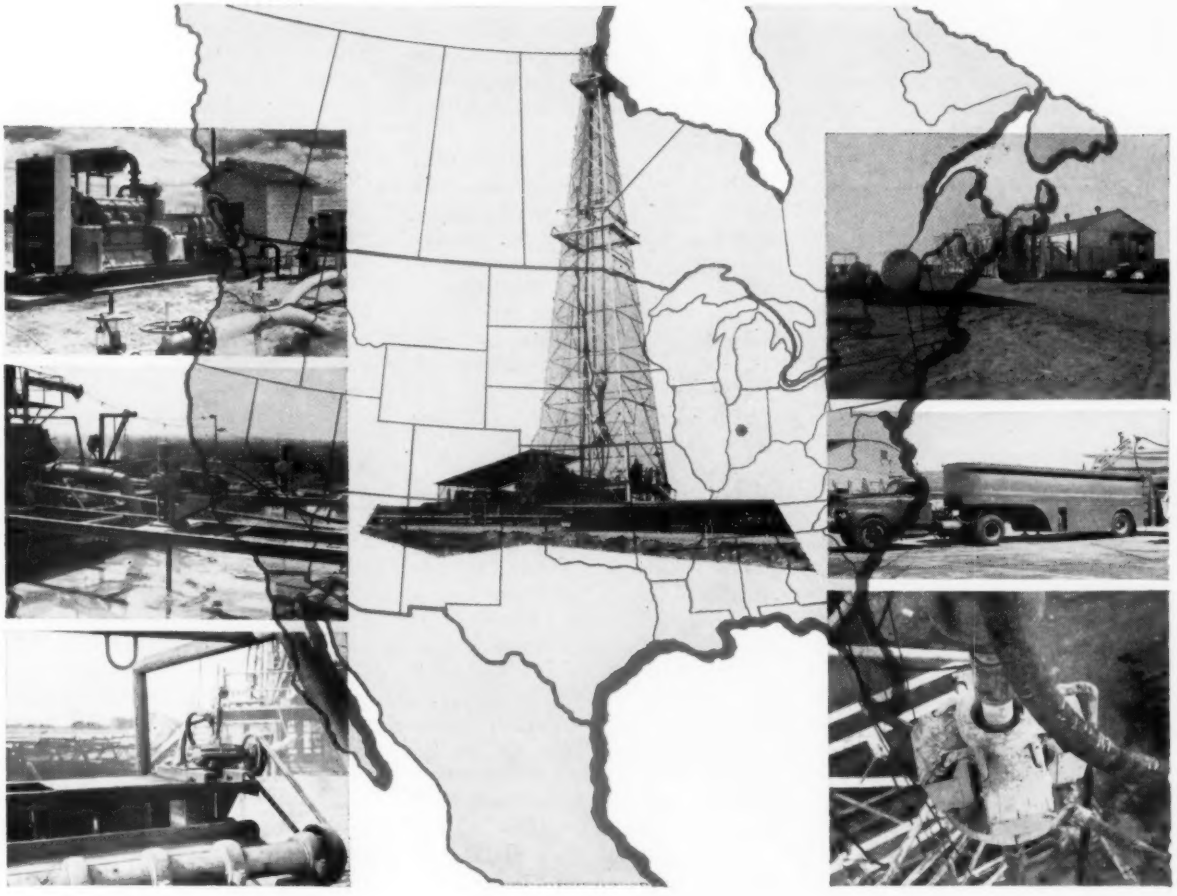
Trenching machines had their problems with the rock and boulders on Schedule 4. They would have good runs for varying distances, then hit the rock. Blasting and backhoes had to take over. Most of the trench on the Mannix schedule was excavated by the latter method. This contractor did his own stringing.

Schedule 3 with Conyes Construction as contractor also hit quite a bit of rock and had to shoot and/or backhoe through it. The backhoes handled the glacial boulders found in the foothills; there was some blasting in the mountains.

Canadian Parkhill, affiliate of Parkhill Truck Co., Tulsa, strung the pipe for the Conyes spreadwork. Their experience in the same operation for contractors on the much more rugged *Scenic Inch* line helped them stay six miles or so ahead of the spreads.

The Conyes and Mannix schedules on the southern end of the Westcoast line were a bit rougher than the two northern schedules. But, it balanced out as they had better roads and access in the southern British Columbia sections. In spite of the wet spring, unusually dry summer, and the rough country, Mannix and Conyes completed 65 to 70 per cent of their schedules during the construction season of 1956.

Dutton-Williams Brothers completed its 120-mile Schedule 1 during the 1956 construction season. They were able to use trenching machines to dig the 6-ft deep by 4-ft wide trench. They took these machines over the summer of the 2900-ft elevation of Pine Pass in the Rocky Mountains. They did their own stringing operation. This was considered one of the toughest sections on the line. It is currently



Wherever you find Oil or Gas you'll find BERRY® HYDRAULICS

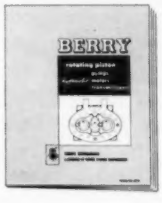
. . . on fan drives in gas compressor stations
. . . on shale shakers and blowout preventers
. . . on tank truck drives
. . . on drilling rig power swivels
. . . on diesel engine automatic starters
. . . on mud mixers
. . . 24 hours a day

There are exceptions, but generally speaking, the advantages of Berry Hydraulic pump/motor drives are known and profitably employed by oil and gas men everywhere. And small wonder!

This rugged power package produces smoother, safer, entirely foolproof power transfer . . . together with infinitely variable speed and finger-tip control. No matter where Berry units are put to work . . . drilling, production, processing or transmission . . . they add up to dollars back in the till.

. . . A Berry Hydraulic Drive is doing the job!

For additional information, write for name and address of your nearest Berry Hydraulics engineer.



NFPA NATIONAL FLUID POWER ASSOCIATION

BERRY HYDRAULICS

A DIVISION OF OLIVER TYRONE CORPORATION

GENERAL OFFICES:
Oliver Building
Pittsburgh 22, Pa.

being proof-tested with natural gas.

Dutton-Williams used some Indian hand labor for clearing work. Roads on their schedule were poor and they had to move in equipment and supplies over "pipeline" roads. One of their spread headquarters had to be located where it was impossible for pipeliners to travel to and from the spread. They solved this problem by using 77 of their own house trailers at camps near the right-of-way. They split the group of trailers into two separate camps. Each was an independent "city" with its own water supply and filtering equipment, kitchen, Caterpiller engine-generator sets electricity, and first aid station.

The construction division of Canadian Bechtel kicked-off spreadwork on its Schedule 2 in May 1956. It immediately ran into wet weather that caused delay. On this spread, 40-ft joints of the 30-in pipe were double-jointed at yards located a short haul from the right-of-way. (See GAS, August 1956, "Bechtel uses automatic welding to double joint on Westcoast's pipeline," pp 112 and 113.) Canadian Parkhill handled the stringing operation under a subcontract for this schedule. Three of the double-jointing yard locations could be spotted for a maximum haul distance of about 15 miles. The fourth, at Prince George made maximum trips of 100 miles necessary.

Canadian Bechtel was able to use trenching machines for most of the trench work in its schedule. Line-up gangs hit a stride of 14,000 ft for a best day and averaged 12,000 ft a day during September. During that month, they made pipeline up to the southern shore of the Fraser river, moved their equipment across on a pontoon ferry, and struck off northward.

The spreadwork of Canadian Bechtel was shut down for winter with about 150 miles of pipe in the ground. In addition, they completed clearing and grading for 24 miles of right-of-way north of the Parsnip river and completed rock trench before the freeze-up.

Engineers estimate that about 70 per cent of the entire Westcoast pipeline was completed when freeze-up slowed spreadwork for the winter season 1956-57. Some pipelining was continued on spreads 3 and 4. Station construction and scrubbing plant and refinery work was carried out on schedule during the winter.

Progress has been more than satisfactory on the whole line. The spring rains and dry summer weather made it hard, but the spreads kept on or ahead of schedule. The dry summer made "hoot-owling" necessary in the heavy forests. The British Columbia Forest Commission took note of the exceedingly dry forests and would let the pipeliners go in only after 6 a.m. They had to be out by 1 p.m.

Compressor stations

Station 1 at Taylor Flats on the Peace river is a full reciprocating station designed for 12,000 hp under the initial plan. After proposed expansion of the project was announced it was upped to 14,000 hp. Seven Ingersoll-Rand KVS-412-1 engine-compressor units, rated at 2000 hp each, will be installed. The station is at about 2000-ft elevation. Construction is underway and rolling fine.

Station 3 near Fort McLeod is an engine-driven, centrifugal-compressor station. The gas engines to drive the compressors will be Nordverg Supairthermal Type FSE-1316-HSC. They are 16-cylinder, V-type, supercharged, spark ignition engines, rated 3550 hp at 500 rpm. Four will be installed with a like number of centrifugal compressors. A speed increaser gear-train (integral with engines) will couple the engine with its compressor unit.

The centrifugal units will be De Laval 24-in. x 24-in. compressors rerated from 3550 hp to 4500 hp. Four machines will develop the 18,000 hp for the station. Work is going forward on this facility.

Station 5 near Australian will be 18,000 hp. Four Nordberg gas engines will drive four 4500-hp De Laval centrifugal compressors.

Work on station 7 at Savona began during the winter. It is expected to have 13,500 total horsepower from three 4500-hp De Laval centrifugal compressors driven through a speed increaser by three Nordberg reciprocating, gas-fired engines.

Pipeline miles between stations 1 and 3 is 151 miles. Maximum elevation is 2900 ft near MP 100. Elevation at station 1 at MP 0 is about 2000 ft. Distance between stations 3 and 5 is 169 miles and the elevation drops to 1560 ft at the latter. Station 7 will be 184 miles down the line from station 5. Elevation rises to 3550 ft, but drops to 1170 feet at station 7. It is 166 miles from station 7 to the International Boundary.

Main jacket water pumps will be Canadian Ingersoll-Rand, model 4, RVL-20. These are designed to circulate jacket water at 685 gpm, operating at 1750 rpm against total head of 70 ft.

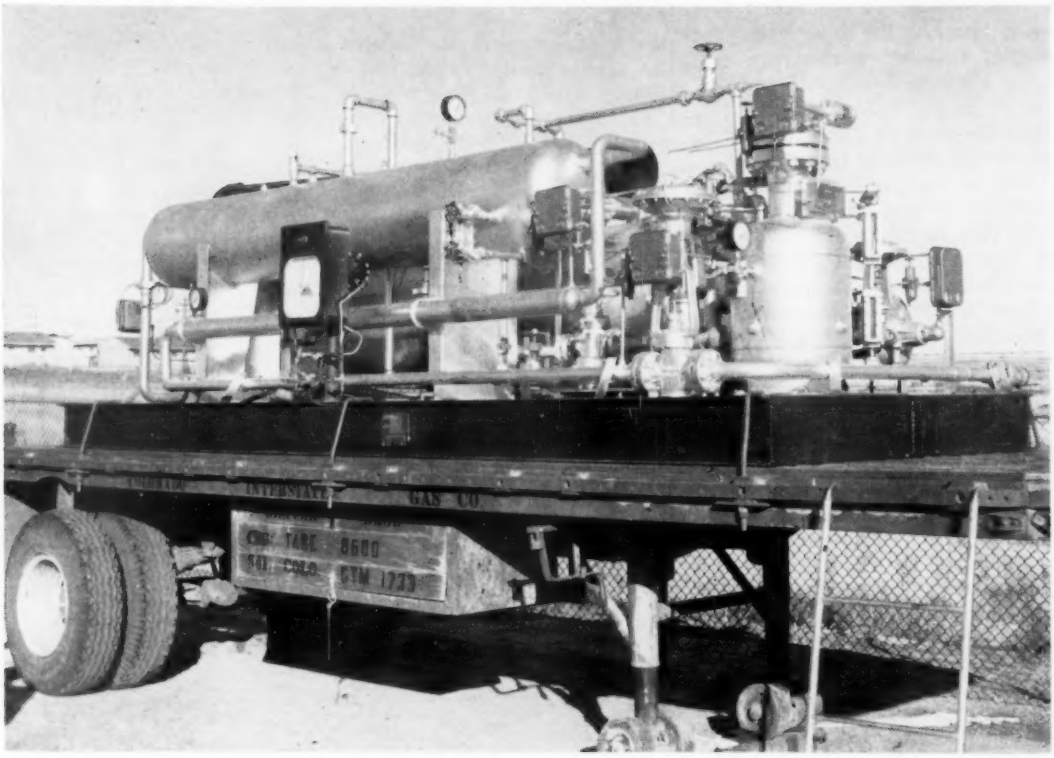
Lube oil coolers were specified to handle 400 gpm and to cool oil temperature from 170° F to 156° F, with 288 gpm of jacket water flowing at 134° F. These units were supplied by Kewanee-Ross of Canada, Ltd.—model 1208 CF.

Lubricating oil filters are Winslow model 57-1543-OB3 full-flow type, rated for 400 gpm. Filters on the lube oil by-passes will be from the same manufacturer, but will have a 15-gpm orifice and be model 21-1465-DCS.

Cooling heat exchanger units will be Trane Co. model GC-7-1. These units have vertical air flow under forced draft. Shutters for controlling air flow are manually operated. The fan is gear driven by a two-speed, 30-hp, Canadian GE electric motor. They are designed to dissipate 8.6 MBtu/hr from 288 gpm of jacket cooling water at tempertures from 170° F to 110° with an ambient temperature of 90° F.

Intake air filters are specified as the oil bath type. They are equipped with explosion-proof, motor-driven pumps and backfire relief valve. Units are American Air Filter, Cycoil, model PV01-54. Exhaust silencers will be Kittell, model 6011-K1.

Estimated cost of the four compressor stations scheduled for construction under the initial plans was $22 million. Under the expanded plans announced early in January 1957, five additional stations are to be constructed to bring the total to nine. The Westcoast line will then be powered to transmit its full 660 MMcf/day capacity. ■



The portable testing unit, at present mounted on this high-boy trailer, will be transferred to a permanent mounting on a low-boy trailer to facilitate ease of operation

Gas well analysis with portable testing unit

By KEN KRIDNER, Senior Development Engineer
Colorado Interstate Gas Co., Colorado Springs

SINCE the day that the intrinsic value of natural gas was recognized as being not a by-product of oil production but as a substance having usages independent of its component oil product, engineers and laymen alike have been confronted with many problems relating to composition of the gas stream. Liquefiable hydrocarbons have constantly presented obstacles to flow and compression at various pressure and temperature conditions, Hydrates of water and hydrocarbon mixtures have resulted in blocked flow lines, inoperative equipment and loss of gas supply. Thus the operating man in general and the engineer specifically have come to realize the importance of having available beforehand an accurate knowledge of the composition and behavior of the gas stream at various pressure - volume - temperature relationships.

A testing unit provided with adequate equipment to permit simulation of flowing conditions of a gas well after the well's connection to a gathering system has been recognized as an ideal solution to obtaining a knowledge of well flow characteristics and problems that will be encountered in attempting production. This information may also be gathered from installation of permanent separation facilities at the wellhead. The cost encountered by following this procedure and the time involved, however, tend to make it undesirable.

Heretofore reference has been made to testing of wells prior to

GAS exclusive

their being placed in production. However, data relating to the composition of the full well stream are also necessary if continued flow is to be achieved after the well is connected to the system. An excessive volume of liquefiable hydrocarbons permitted to remain in the full flow stream may well result in free liquid accumulating in low spots on the gathering system restricting the gas movement. Drips can be used to minimize this plugging condition but provide no solution in themselves.

The test unit acquired by our company and discussed here is equipped to permit the flow from the well to be diverted through the test unit, the liquid and gas separated and measured independently. The two streams are then commingled and returned to the gathering system downstream of a restrictive pressure device. This pressure drop is provided in order that the commingled stream may flow into the line against the prevailing pressure at that point.

This provides a background to the basic usages to which our testing unit will be applied. The following basic conditions were recognized in the design of the unit giving consideration in the selection of equipment to capacity and pressure ratings:

(a) Necessary addition of heat prior to separation and pressure reduction.
(b) Maintaining constant temperature and pressure on the separation equipment.
(c) Accurate separation and measurement of the liquid and gas streams.
(d) Protective devices on heater fuel supply and equipment.
(e) Ease of operation in transferring location of the testing unit.

Design

The basic parts of the portable testing unit are the heater, separator, liquid metering chamber, gas measurement equipment and the back-pressure control valve. Around these basic items are utilized chokes, dump valves, instruments and safety controls that insure the continued accurate and safe operation of the unit. Safety has been considered as a matter of primary importance.

Basic flow

Our initial step in the design of the testing unit was the preparation of a flow diagram reflecting the basic work to be performed by the unit. *Fig. 1* shows the gas flow as it passes through the equipment on the test unit. It was desired to divert the full well stream at wellhead conditions of pressure, volume and temperature through a minimum of two passes through an indirect type heater, through a high-low automatic shutoff valve which would protect against overpressuring of the separator and downstream equipment or rupture of any vessel and then further heating through additional passes through the heater, throttling by use of adjustable chokes to regulate the rate of flow.

The heated gas stream would then flow through a horizontal dual-gravity dump separator. Here all liquids would be entrapped and the overhead gas stream passed through a mist extractor and measured by use of an orifice meter. A back-pressure regulator actuated by a pneumatic control placed in the flow stream would insure constant pressure on the separator. The liquid trapped in the separator would be dumped as a mixture of water and condensate or individually as liquid and condensate. A liquid meter would be installed to meter the water dumped individually.

The condensate stream, in which volume we are primarily interested, would be measured by use of a metering chamber equipped with a float-operated controller on the upstream and downstream valves. After the metering chamber has completed its dump cycle, the downstream valve would be closed and the upstream valve opened. Each dump of the metering chamber would be recorded on a counter mechanism and would be read at periodic intervals. A Pemberthy gauge glass mounted on the metering chamber would allow a record to be kept of the liquid build up in the vessel. The liquid dumped would be commingled with the residue gas and the commingled stream flared to atmosphere or flowed back into the gathering system. If desired, the condensate could be dumped into a stock tank for conservation and further use.

The fuel gas to fire the indirect heater and to operate the controls would be withdrawn from the top or gaseous portion of the separator, flowed through a single pass of the heater and then reduced in pressure to 35 psig. A water trap provided to isolate any free liquid and a Partlow automatic safety shutoff control provided in the event the heater burner or pilot should be extinguished would further protect the heater. Further reduction of the pressure to burner conditions would be made after the control gas takeoff. Thermostats would be installed in the separator and heater to protect against overheating in the heater and to permit a constant temperature of the gas during separation.

Selection of equipment

Each of the major items was selected to perform the function as shown in the desired basic flow design. In this selection, we had various conditions to be considered.

Heater

We recognized that the test unit might be called upon to preheat a gas stream from pressure conditions to 4000 psig, temperatures of 35° F to temperatures of 80° F. Three component operations utilizing 16 passes through the heater were desired.

The heater selected was an indirect type including a 750,000-Btu per hour firebox and flow coils consisting of 16 2-in. seamless tubes having a maximum working pressure of 640 psig. A 2-in. automatic high-low shutoff was installed after two passes, a needle nose choke following six additional passes and a throttling choke after the eight remaining passes.

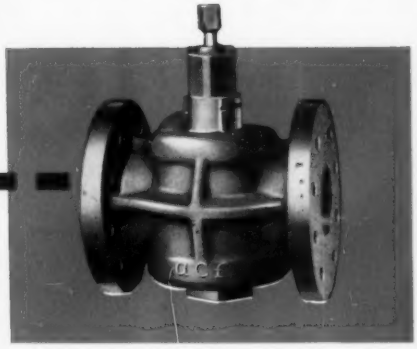
Separator

We estimated the maximum production to be tested would be a rate of 5 MMcf/day having a liquid volume of 200 bbl per day. The separator must be oversized for these conditions to insure accurate and complete separation of

(*Continued on page* 146)

Hot Tapping

through ACF Round Port Lubricated Plug Valves



A standard ACF Round Port Valve is the perfect valve to use for making hot taps.

The round port of the plug and bore through the body provide a full, unobstructed passage for the tapping drill. True and perfect alignment of port and body bore prevent damage to seating surface.

Threaded or flanged ACF Round Port Valves can be used. The valve is attached to the weld nipple, tapping machine mounted on the valve and hot tap made in the usual manner.

When the hot tap is completed, your ACF Valve will give you dependable, trouble-free service years ahead. Features which assure perfect performance are split-second, quarter-turn opening and closing; non-wedging cylindrical plug; Teflon* head gasket and the right ACF Lubricant to seal securely and prevent wear and abrasion.

Step up valve performance— cut down valve costs with ACF Lubricated Plug Valves.

* Du Pont Trade Mark

5613

W-K-M

DIVISION OF ACF INDUSTRIES INCORPORATED

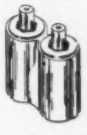
Plant: Missouri City, Texas . Mailing Address: P. O. Box 2117, Houston, Texas

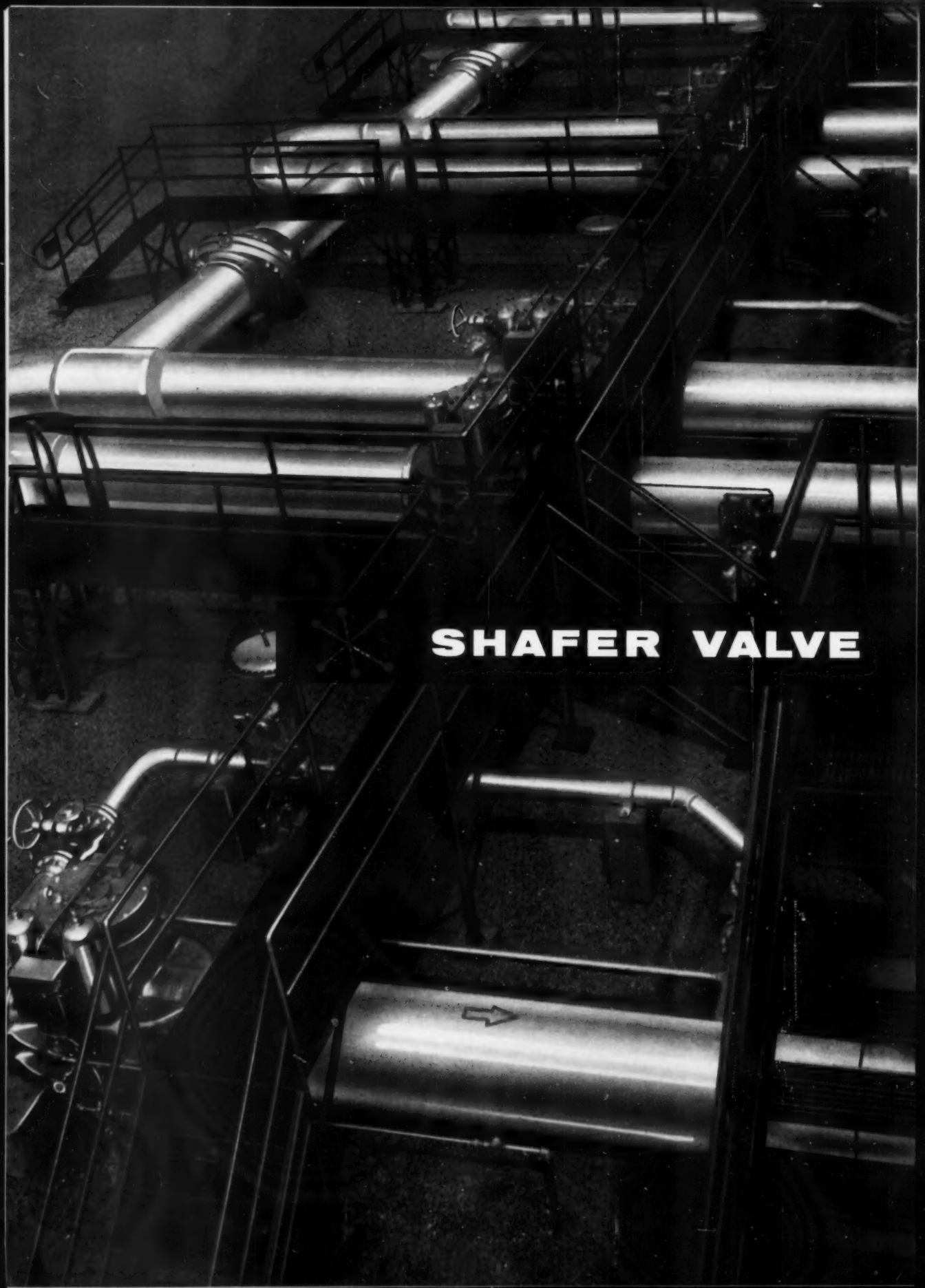
MANUFACTURERS OF

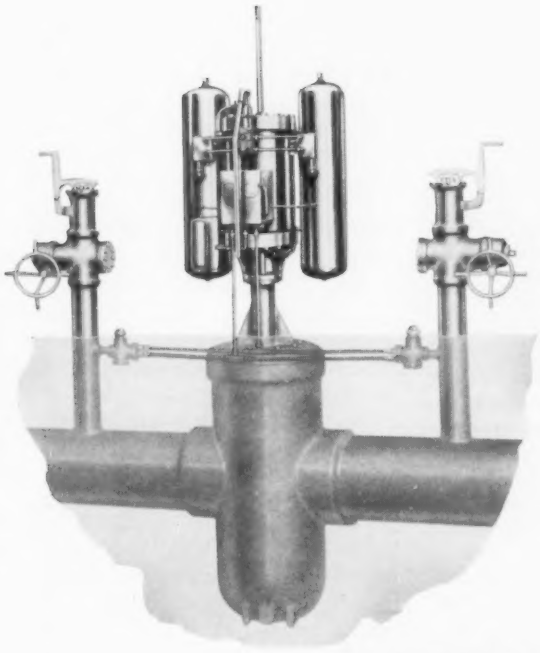
W-K-M THROUGH-CONDUIT GATE VALVES

ACF LUBRICATED PLUG VALVES

KEY RETURN BENDS AND FITTINGS



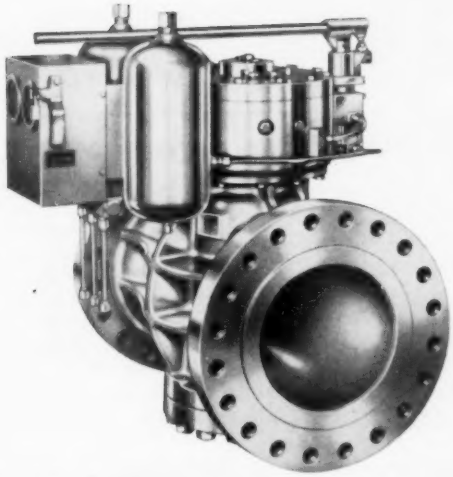

SHAFER VALVE



Shafer Valve Operator with automatic and manual control mounted on a 30-inch gate valve.

for speed
of operation . . .
balanced power,
with only one
moving part . . .
proven reliability

OPERATORS AND CONTROLS



Shafer Valve Operator with automatic and manual control mounted on a 16-inch lubricated plug valve.

SHAFER

VALVE COMPANY, INC.

MANSFIELD, OHIO

(*Continued from page* 142)

the gas and liquid streams. Since water and condensate will be separated and further separation into the component volumes is desired, a dual gravity dump valve was utilized.

The separator unit selected was a horizontal type (to lower the center of gravity of the test unit) gas-oil-water vessel having a single chamber and a nominal shell size of 20 in. x 10 ft 0 in. The unit is designed for a throughput of 15 MMcfd and 2000 bbl per day at a pressure of 1000 psig at 100° F. This vessel was designed for 1000 psig working pressure and hydrostatically tested to 1500 psig. Overpressure protection is provided by use of a 1½-in. safety head and a 2-in. spring-loaded relief valve.

Metering chamber

The liquid as separated in the separator must be measured accurately if the test data are to be of value. It was felt that the use of a liquid meter would require installation of a prover and the meter proved before each test. This would be required in view of the unit being moved frequently. A metering chamber was believed to be the most accurate device for our use, utilizing two floats mounted on a vertical rod for linearity of movement and which would control the opening and closing of the valves to and from the chamber. The chamber is equalized in pressure by a connection to the top of the separator. Gauge glasses were desired throughout the length of the chamber to permit the operator to follow the liquid production and in this manner obtain data as to slugging conditions.

The metering chamber was built for us using a nominal shell size of 20 in. x 15 in. designed for a working pressure of 1000 psig and hydrostatically tested to 1500 psig. The upper and lower sections are reduced to a diameter of 6 in. and the floats required to trip within this restricted area to improve on accuracy of operation. A counter mechanism has been mounted to record the number of times the unit has been dumped and a thermometer well installed for record of temperature. Sampling connections are included to permit samples to be withdrawn for liquid gravity, atmospheric flash and fractional tests.

Gas measurement

Since the unit may be shut-in easily, we felt justified in using a simplex type orifice fitting instead of a bypass assembly or a senior type fitting. A 4-in. meter tube was designed in accordance with the American Gas Association standards utilizing a simplex type orifice fitting. Flange taps leading to a bellows type orifice meter were used and the differential pressure existing across the restriction placed in the line recorded on the orifice chart. A thermometer well installed downstream of the flange is used to obtain the flowing temperature. The back pressure control used is a 2-in., 600# ASA flanged motor valve having a stainless steel double port parabolic inner valve.

Fuel gas and safety protection

Certain protective devices were considered essential to the safe operation of the heater. A strainer with a pop valve and hand drain were installed to prevent water accumulating in the fuel line. A Partlow automatic safety shutoff valve is used to shut off the fuel supply gas to the pilot and main burner in the event the fire in the heater should be extinguished.

The use of the high-low shutoff valve insures the safety of the gas well being tested and of the personnel conducting the test. Chiksan connections and hammer-on unions are used as couplings on the 2-in. tubing flow line from the wellhead to the testing unit to expedite rapid and simple connection of the test unit to the gas well.

The portable testing unit is now mounted on a high-boy trailer but is currently being transferred to a permanent mounting on a low-boy trailer to facilitate ease of operation. The unit has been mounted on a trailer to permit use of a tractor only during the period when the trailer is being moved from one location to an-

(*Continued on page* 157)

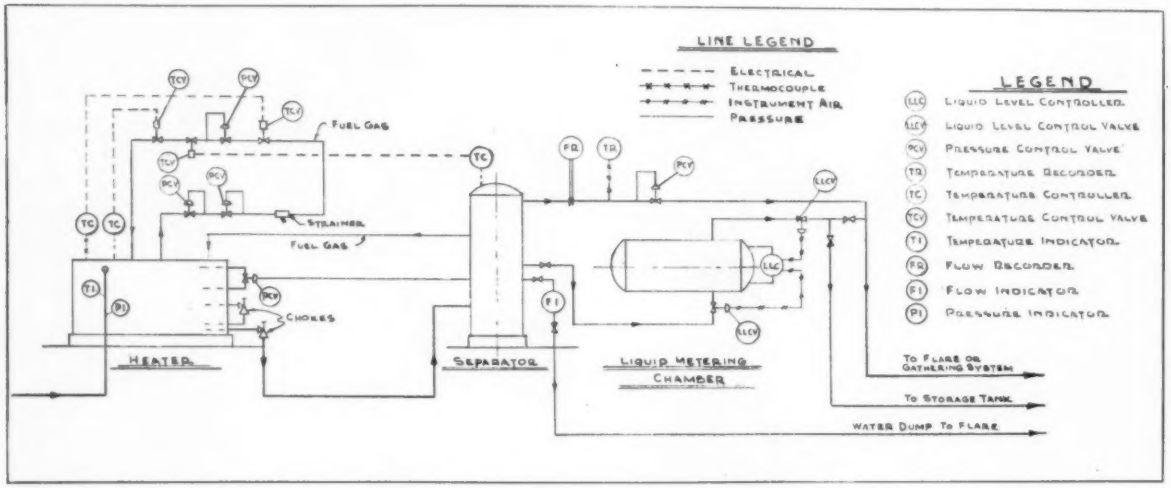
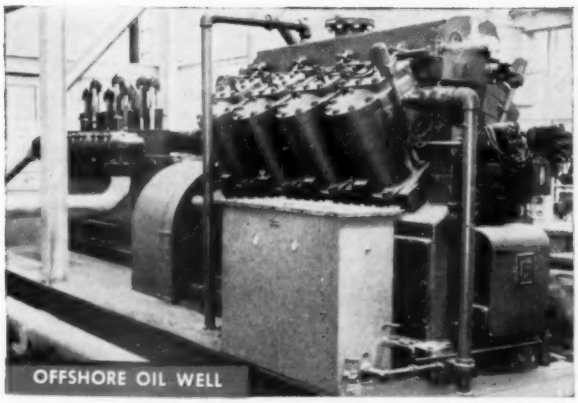
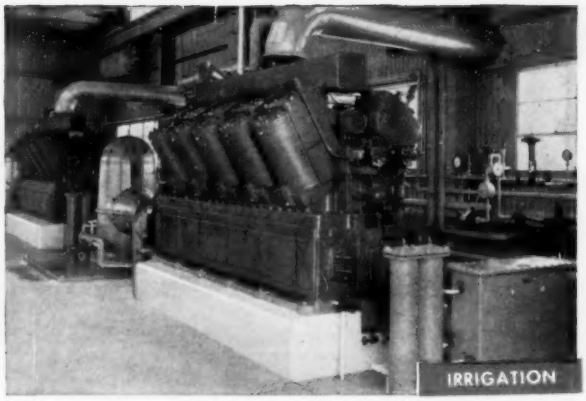


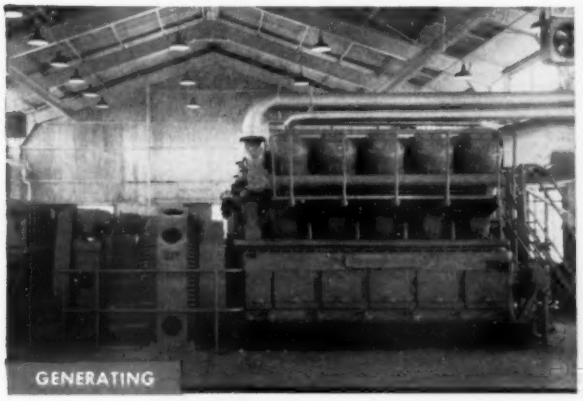
Fig. 1. Flow diagram showing gas flow as it passes through the equipment on the test unit



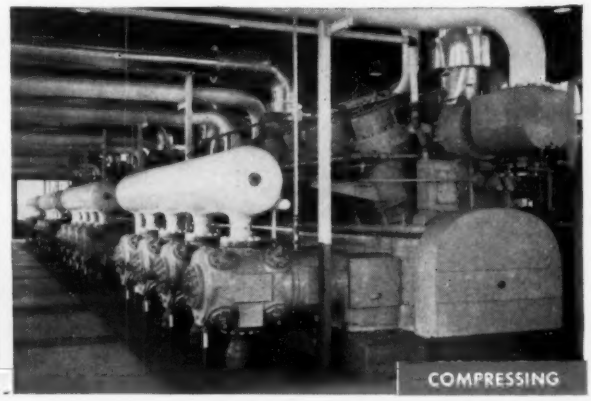
This 295-hp PJVG gas engine is mounted on a platform in the Gulf of Mexico driving a reciprocating crude oil pump. PJVG engines are built in 220 and 295-hp sizes.



The 680-hp PSVG units above are driving Ingersoll-Rand centrifugal pumps on a large irrigation project. PSVG gas engines cover the 408-816-hp range.



This 1100-hp PKVG is shown at the task most frequently assigned to I-R power units: a-c generator drive is a natural for smooth-running I-R 4-cycle gas engines. PKVG's are available from 880 to 1760 hp.



All I-R gas engines are also offered in integrally-built engine-compressor units. Above are 2000-hp turbo-charged KVS compressors on gas transmission. 4-cycle engine-compressors are available from 120-2000 hp.

POWER for any purpose

gas engines deliver heavy-duty power economically

Whatever the task, Ingersoll-Rand heavy-duty 4-cycle gas-engine equipment offers the highest dependability, flexibility and long-run economy. Built for 24-hour-a-day, continuous operation on a wide range of fuels, these engines are especially suitable where close control is important (such as a-c generator drive). Where I-R power units and their companion engine-compressors are used together, the similarity of operation and the interchangeability of parts effects additional important economies. Contact your I-R representative now for more information.

4-CYCLE

Ingersoll-Rand

6-491

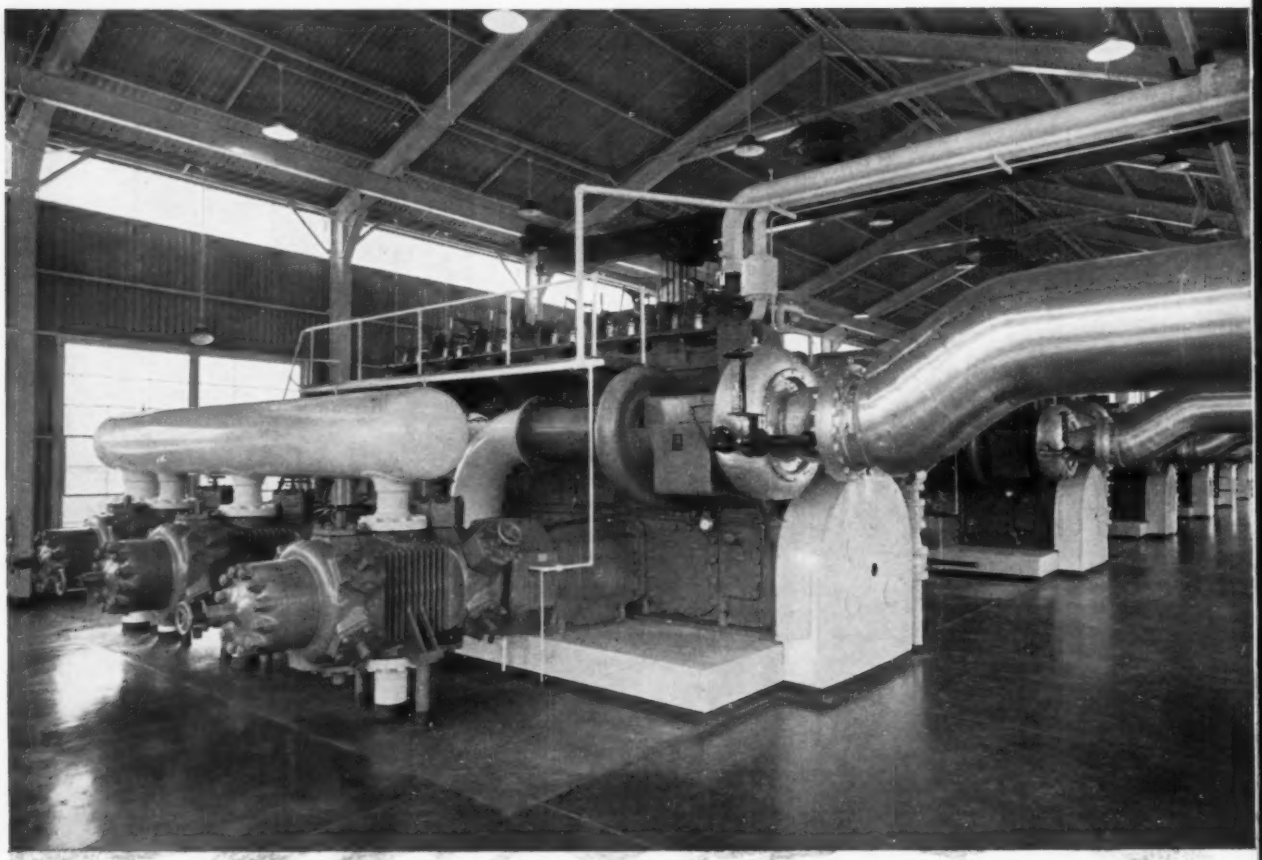
11 Broadway, New York 4, N.Y.

COMPRESSORS • GAS AND DIESEL ENGINES • ROCK DRILLS • PUMPS • TURBO-BLOWERS • AIR AND ELECTRIC TOOLS

For Pacific Northwest's...

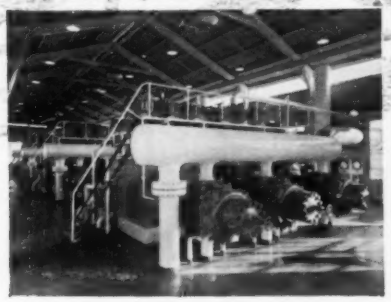
Altitude: 6600'

Station-1. Ignacio, Colorado
Six–2000 bhp. Clark TLA-6 Turbo-supercharged Compressors



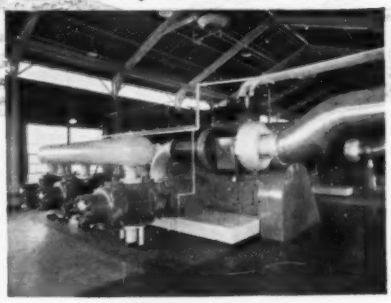
Altitude: 5620'

Station-2. Moab, Utah
Four–2000 bhp. Clark TLA-6 units



Altitude: 6000'

Station-4. Rangely, Colorado
Four–2000 bhp. Clark TLA-6 units



Mile high pipeline

46,000 BHP. of Clark Turbo-supercharged Compressors Furnish Over Half the Main Line Horsepower

Some of the most rugged terrain in the country is covered by Pacific Northwest's 1500 mile pipeline serving the northwestern part of the United States. Twenty-three Clark 2000 bhp. TLA-6 turbo-supercharged compressors supplied over half of the main line horsepower.

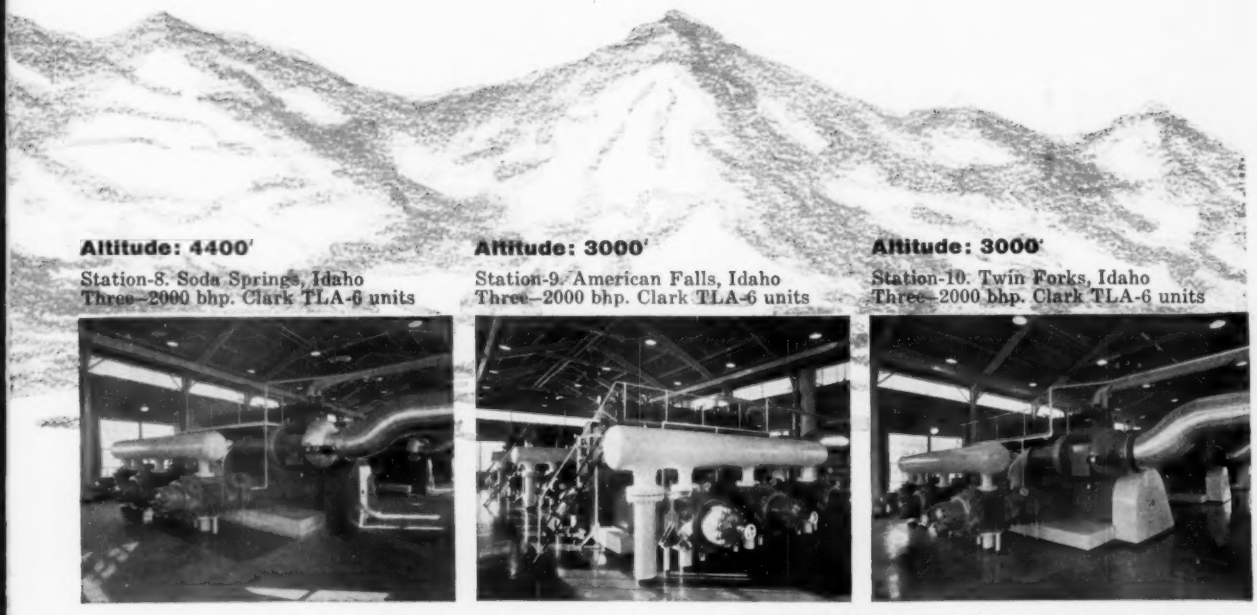
With stations operating at elevations of up to 6600′, normally aspirated engines would have required heavy deration. The Clark TLA-6 units, however, operate with substantially less deration because they are turbo-supercharged. (Clark can now supply for its TLA units, as optional equipment, a special turbocharger for high altitude applications which permits sea level ratings. No deration is required.)

Mountain top locations or "down in the flats", the modern Clark turbo-supercharged compressor is the most economical prime mover to install on today's pipelines. They are built in seven sizes ranging from 1100 to 3400 bhp. Your nearest Clark representative will be pleased to give you complete information.

CLARK BROS. CO., OLEAN, NEW YORK
One of the Dresser Industries
Offices in Principal Cities Throughout the World

CLARK®

Turbo-supercharged Compressors



Altitude: 4400′
Station-8. Soda Springs, Idaho
Three–2000 bhp. Clark TLA-6 units

Altitude: 3000′
Station-9. American Falls, Idaho
Three–2000 bhp. Clark TLA-6 units

Altitude: 3000′
Station-10. Twin Forks, Idaho
Three–2000 bhp. Clark TLA-6 units

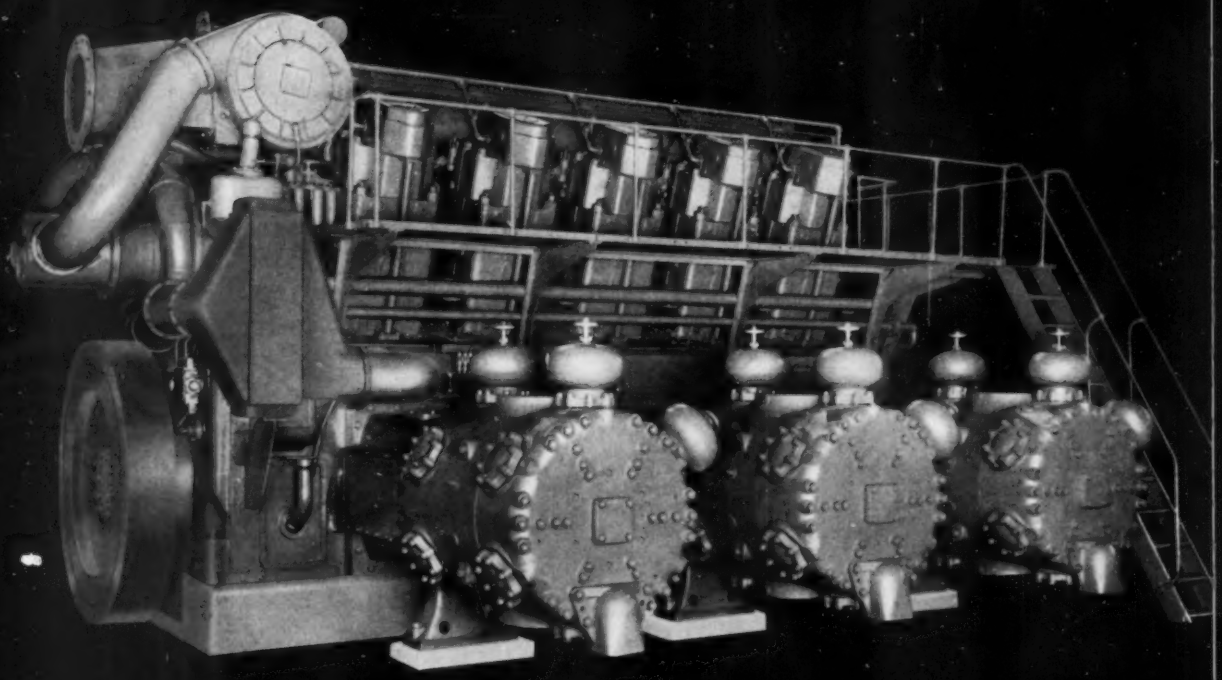
NOTE: All horsepower ratings are based on sea level elevation.

Announcing....

Cooper-Bessemer

SERIES TURBOCHARGED

V-Angle Compressors



... in a range of sizes including the most powerful and most efficient engine-driven compressors available today!

This unique development, with exhaust-driven and engine-driven turbo-compressors operating in series, provides *denser* air in abundant volume for a new high in combustion and scavenging efficiency.

Only Series Turbocharged V-Angles offer the following combination of feature advantages . . .

1. **A full 40% more horsepower than immediate predecessor engines of the same bore, stroke and speed (up to 3,500 bhp at 250 rpm).**
2. **Greatly increased thermal efficiency, with lower guaranteed fuel consumption.**
3. **Lower investment in heat dissipation equipment.**
4. **Higher-than-ever horsepower-to-space ratio.**
5. **Unmatched economy in the cost per horsepower of housing, foundation, piping, supervision and maintenance.**
6. **No de-rating for altitude! Full rated power up to 7500 feet.**
7. **Efficient turbocharging right from the start-up and throughout all loads and speeds.**
8. **Highly successful, field-proved performance.**

for further details on Series Turbocharging, its unusual advantages and just how it operates, send for new bulletin No. ST-82... or contact the nearest Cooper-Bessemer office.

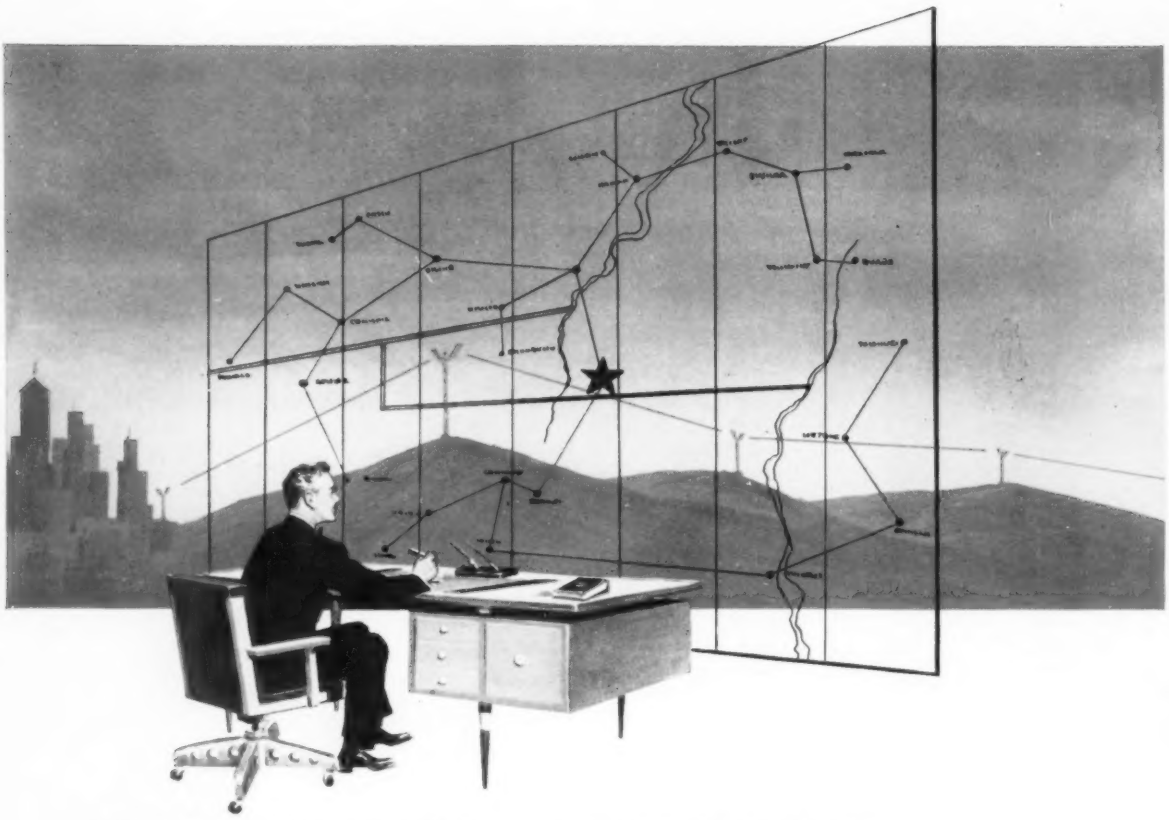
BRANCH OFFICES: Grove City • New York • Chicago • Washington • San Francisco • Los Angeles • Houston • Dallas • Odessa • Pampa • Greggton • Seattle • Tulsa • St. Louis • Kansas City • Minneapolis • New Orleans • Shreveport • Casper

SUBSIDIARIES: Cooper-Bessemer of Canada, Limited . . . Edmonton • Calgary • Halifax.
Cooper-Bessemer International Corporation . . . New York
Chacao • Havana • Mexico City

Cooper Bessemer

GENERAL OFFICES: MOUNT VERNON, OHIO

ENGINES: GAS · DIESEL · GAS-DIESEL
COMPRESSORS: RECIPROCATING AND CENTRIFUGAL
ENGINE OR MOTOR DRIVEN



TEN MILES OR A THOUSAND . . .

Motorola Microwave puts complete operational control at your fingertips

Cross-country or cross-town—Motorola Microwave can give you centralized control in one *complete*, privately-owned communication system that spans city streets, rivers, and mountains with ease. Multiply your present communication facilities with this work-horse that provides multi-channel facilities for transmitting and receiving orders and instructions by voice, printed messages and control signals. It will speed a thousand tasks a day, working 'round the clock to give you better control, improved coordination and increased efficiency . . . all at a substantial savings in cost.

With Motorola Microwave serving all types of applications (many of them in your industry) you get the benefit of extensive experience. In installation after installation, operational records prove that Motorola Microwave performs better, lasts longer and costs less to maintain.

Learn how Motorola Microwave can give you the *complete* communication system for centralized control. Write, wire, or phone today.

VOICE

Private line and party line—manual and dial telephone circuits—VHF mobile and base station 2-way radio . . . *all* can be carried hundreds of miles, economically and privately, by Motorola Microwave.

PRINTED MESSAGES

Read a message, a chart or facsimile a thousand miles away in seconds. Assemble necessary information the fast, efficient way. Teleprinting, telemetering, telegraph, facsimile are at your command with Microwave.

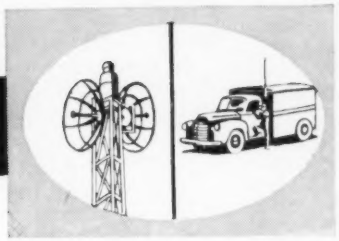
CONTROL SIGNALS

Read meters, turn valves, from *any* central location you want. With Motorola Microwave you can have supervisory control, remote control, and remote indication. Greater efficiency at less cost.

MOTOROLA MICROWAVE

Motorola Communications & Electronics, Inc., 1400 N. Cicero Ave., Chicago 51, Ill., A subsidiary of Motorola, Inc.

communications



Pipeline testing facsimile communication medium

COLORADO Interstate Gas Co., Colorado Springs, is testing facsimile transmission of operational material over its microwave radio system. Purposes of the month-long program are: (1) technical evaluation of signal handling capabilities of microwave for transmitting the facsimile signal, and (2) evaluation of facsimile communication for pipeline operations.

Duplicate sets — separate transmitter and receiver units — of facsimile equipment were installed at the company's communications center in Colorado Springs and the Bivins, Texas (near Amarillo) compressor station. Channel 7 of the existing microwave system was allocated for the tests. The facsimile units were tied-in with this channel in four-wire circuit form. Multiplexing permits simultaneous transmission-reception in both directions. But, most of the operation has been with the transmitter at one point working while the remote receiver records the communication and the receiver at the transmitting point monitors.

In the first phase of the program the facsimile signal was transmitted from Colorado Springs to the Bivins microwave repeater station and back to the facsimile receiver in Colorado Springs. This produced a microwave circuit of about 640 miles. Definition of the copy received from the long circuit was excellent. As in the case of GAS' facsimile via microwave demonstration (see GAS, September 1955, pp 107-120), the technical feasibility of the medium and carrier was proven.

The next phase of the test program was to determine types of operational material that could be transmitted with the facsimile machines. Many types of written, pictorial, and graphic material were simply transmitted Colorado Springs-to-Bivins and vice versa. The only important limitation resulting was in maximum size. The facsimile transmitter can handle copy up to and including 8.5 in. by 14 in. during a single transmission. However, larger copy can be sectionalized and sent in numbered sequence.

On April 1, personnel of the special projects and communications departments, working together, put the program into a week-long utilization test. Purpose of this phase is to study applications the various departments of the company made of the facsimile communications medium. Two immediate trial applications were sending orifice meter inspection reports for the measurement department and well-switching reports for the dispatching department.

The well - switching operation was particularly interesting. Well-switching instructions were hand written on a form by the dispatcher. This was facsimile transmitted from Colorado Springs to Bivins. The facsimile form received was taken from the receiver and the instructions voice transmitted from a VHF base station. Mobile units in various switcher trucks received the voice instructions. The switchers carried out the instructions and voice relayed action taken back to the Bivins VHF base.

Action taken was recorded on the same facsimile-paper form conveying the instructions. It was placed on the Bivins FAX transmitter and sent on the microwave channel back to the dispatcher in his Colorado Springs location. Dispatcher then had a written facsimile record of this instructions and action taken.

Other material from the various departments will be used to test further practicality of the facsimile medium. An investigation will be made to determine the degree of acceptance of the medium by operating, engineering, and executive personnel.

The simplicity of facsimile equipment operation is remarkable. The material to be transmitted is simply clipped on to a drum. A scanner is positioned. The unit's cover is snapped into place, and a "start" button is hit. From there on, it is all automatic. The transmitter aligns the scanning device, synchronizes itself and the remote receiver(s), and starts transmission. If the operator wants to monitor the transmission on the sending-point receiver, a switch is moved to "monitor" position before hitting the "start" button.

When the operator sees that the copy has been transmitted, a "stop" button is pressed and the switch moved to "receive." Copy material is then removed from the drum and returned to the originator.

We saw a secretary learn to operate the facsimile machines in less than 10 minutes. In 10 more minutes she was an "expert."

The equipment used in the test program was made and installed by Acme Telectronix division, NEA Service Inc. Since installation, "Tex" Colgrove, superintendent of communications for Colorado Interstate, has handled calibration, adjustment, and maintenance. The microwave system is under the supervision of W. I. Blount, supervisor of communications and dispatching. Utilization tests are being coordinated by Ken Kridner, senior development engineer of the special projects department.

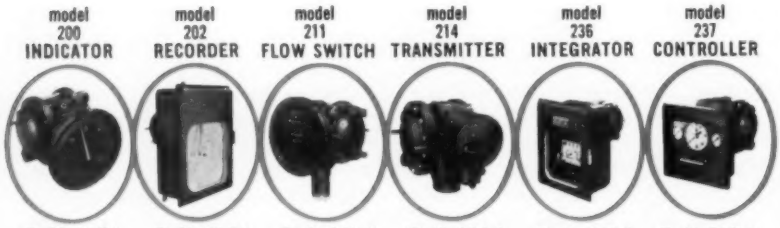
It is probable that after completion of tests currently in prog-

WANTED: TOUGH JOBS!*

*FOR A METER BODY BUILT TO 'TAKE IT'!

The Model 199 Differential Pressure Unit, a BARTON development, was designed to answer industry's needs for a compact, yet rugged device for accurately sensing differential pressure. It has found extensive use in the many fields of Instrumentation and Automation for the precise measurement of FLOW, Liquid Level and Differential Pressure. The unit incorporates the patented BARTON RUPTURE-PROOF BELLOWS principle, internal motion pickup and torque tube transmission to the exterior of the housing. The Model 199 Differential Pressure Units are available with differential pressure ranges from 0-20" W.C. to 0-50 PSI with safe working pressures to 6,000 PSIG. All BARTON bellows units are hydraulically tested and overranged to 1.5 times the safe working pressure, regardless of the differential range.

For further information, contact Barton Sales Representatives in principal cities.



Bull. 11C4 Bull. 11C4 Bull. 211-1 Bull. 214-1 Bull. 236-1 Bull. 237-1

199-357

BARTON INSTRUMENT CORPORATION

580 MONTEREY PASS ROAD, MONTEREY PARK, CALIFORNIA

ress, other facsimile units will be operated in the same evaluation program.

AT&T's tariff filing suspended until June

American Telephone & Telegraph's tariff filing on lease and maintenance activities has been suspended until June 28 by the FCC. The commission has started an investigation to determine if these lease-maintenance arrangements constitute a common carrier service subject to FCC jurisdiction. The commission also wants to know if the tariffs are lawful.

The evidential hearing will be presided over by an FCC examiner. He will hear the evidence and then turn a certified record over to the commission for decision. Neither an initial nor a recommended decision will be prepared by the examiner.

If the commission finds that it has jurisdiction, it will then schedule further hearings to decide if any of the charges, classifications, regulations and practices contained in the tariff schedules are or will be unjust and unreasonable.

Parties who filed protests to the tariff will be allowed to intervene in these hearings if they file a notice of intention to participate.

Court review sought in California case

Several parties, including the City of Los Angeles, have filed petitions with the California Supreme Court for a writ of review in the Pacific Telephone & Telegraph Co. tariff case.

Los Angeles asks the court to issue the writ to the California Public Utilities Commission directing the commission to certify the transcript and records of the case to the court. The court was also asked to review the record and the PUC decision and then to "annul and set aside such decision and remand the record and proceedings to the PUC" with directions to reject Pacific Tel & Tel's proposed Schedule No. 108-T.

If a writ of review is granted in this proceeding, it is anticipated that the Petroleum Industry Electrical Association will file an *amicus curiae* brief supporting the position of the opponents of the telephone company. ■

USER BENEFIT No. 3

ACCURACY!

got GARRETT RELIEF VALVES

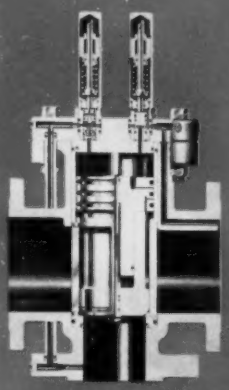
Here's how GOT obtains greater accuracy

Garrett stresses accuracy at set pressure. This feature is inherent in the design of Garrett Valves, which provide for a pressure opened, pressure closed main plunger. The main plunger is entirely free of the inconsistencies which are invariably present when a valve must open against a large, stiff spring.

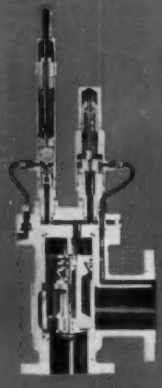
In the Garrett Relief Valve, small precision springs are used, one in the Relief Control to control opening, and one in the Blowdown Control to control closing. By separating opening and closing functions, compromise is eliminated. Each spring does one job only, entirely independent of each other. Consequently, much higher accuracy is obtained than is possible when a single, heavy spring must control both opening and closing.

Write for literature, or ask your Garrrett representative about Garrett Relief Valves . . . the valves you can depend upon for accurate, reliable protection.

REPRESENTATIVES IN PRINCIPAL CITIES IN THE UNITED STATES AND ABROAD



Garrett Type "D" Relief Valve. Sizes, 1" through 8", single or dual outlets, for working pressures from 150 to 5000 psi. Supplied with soft or hard seats, screwed or flanged connections.



Garrett Type "E" Relief Valve. Sizes, 1" through 8", for working pressures from 25 to 200 psi. Soft or hard seats, screwed or flanged connections.

Garrett Oil Tools, Inc.
P. O. BOX 2427 • LONGVIEW, TEXAS

DIVISION OF [illegible] INDUSTRIES, INC

J&L pipe delivers dependable service

J&L tubular products pass the most critical gas industry test of all . . . service on the job. Long and dependable pipe life is assured through J&L's exacting quality control, extensive research and testing.

Specify J&L drill pipe, casing and tubing for gas well drilling and production, J&L line pipe for gas transmission and distribution. When you buy J&L tubular products you buy long, dependable service on the job. Buttweld, lapweld, seamless and Electricweld are available in size ranges from ½″ to 14″ O.D.

Write today for complete information on the J&L line of tubular products. Jones & Laughlin Steel Corporation, Department 529, Three Gateway Center, Pittsburgh 30, Pennsylvania.

Jones & Laughlin

STEEL . . . a great name in steel

(*Continued from page* 146)

other. Thereafter, the tractor is free for use elsewhere in its operating area.

Other necessary testing equipment is carried in a station wagon used to transport personnel and to serve as an office for the personnel in charge of the testing unit. Included in the auxiliary equipment are test gauges, specific gravity indicating equipment, sampling containers and computers. We now contemplate the acquisition of a portable fractometer to permit rapid analysis of the gas and liquid streams. Adequate flood lighting equipment to permit continuous night operations is carried in the station wagon.

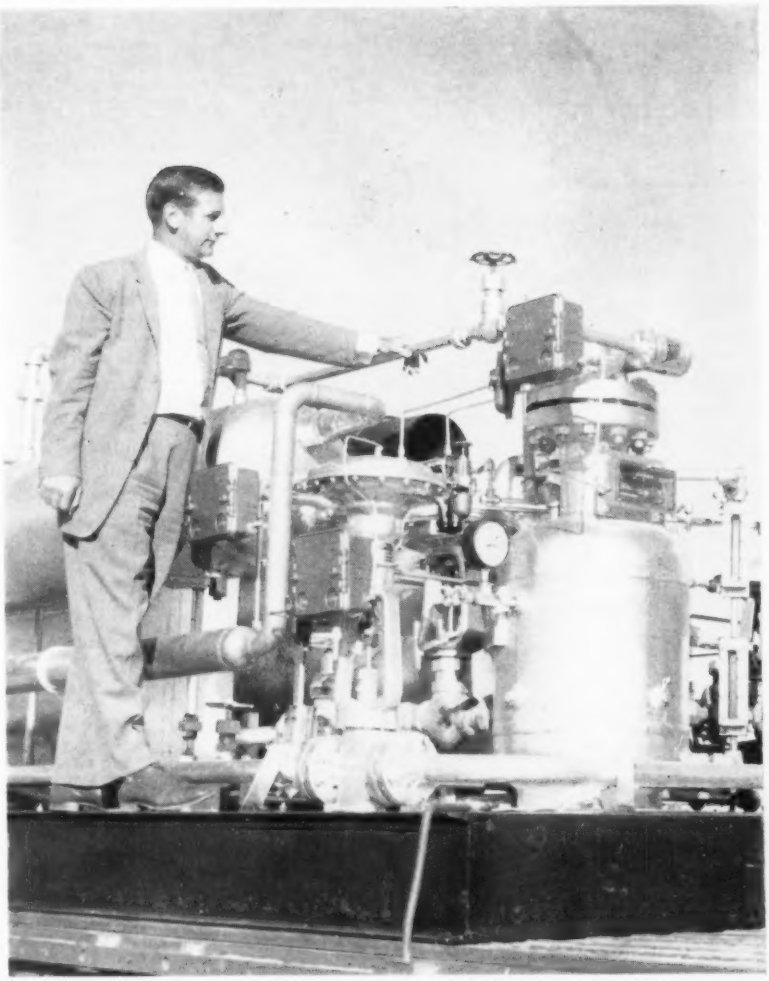
Testing

The portable test equipment will be used by our company to conduct tests of the following types:

1. Deliverability tests — Single or multiple point flow tests may be conducted using a predetermined back pressure and a set rate of flow. The wellhead pressure can be taken by test data and the rate of flow against the set back pressure computed. The bottom hole pressure may be determined concurrently with the test data by use of bottom hole pressure equipment.

2. Gas-oil ratio tests — This equipment has been designed to permit conducting gas-oil ratio tests with results reflected at predetermined conditions of pressure, temperature and flow rate. In addition, samples are obtained from the liquid and gas streams and results of the fractional analysis recombined on the gas-oil ratio to compute the full stream composition.

3. Flow tests—Tests of the gas stream during conditions of normal production may be conducted by diverting the full well flow through the unit, measuring the volume and characteristics of the liquid and residue gas independently, then returning the commingled stream to the gathering system. In this manner, the presence of undesirable quantities of water and foreign substances may easily be detected and measured. Use of the portable unit in this manner precludes the necessity for installing expensive equipment that may not be applicable to the problem encountered.



Author Kridner examines the testing equipment which permits the flow from the well to be diverted through the test unit, where the liquid and gas are separated and measured independently.

4. Evaluation test — Testing of wells where only wellhead equipment may be present and where erection of heating, separation and storage facilities would require time and money, may be accomplished easily with the portable unit affording an accurate evaluation of the capabilities of the wells. In this manner management decisions as to the practicality of connecting isolated or remote wells is aided.

Conclusion

A portable testing unit of the type and design described permits an accurate evaluation of the component characteristics of the gas stream produced from gas wells. This unit provides a tool which may well furnish engineers with basic data resulting in improved operations of the gas wells. Our unit, we believe, will permit us to follow closer the operations of our wells and enable us to obtain basic data relating to flow characteristics and capabilities of new wells available for connection to our facilities. ■

GAS progress reports

NEW CONSTRUCTION PLANNED

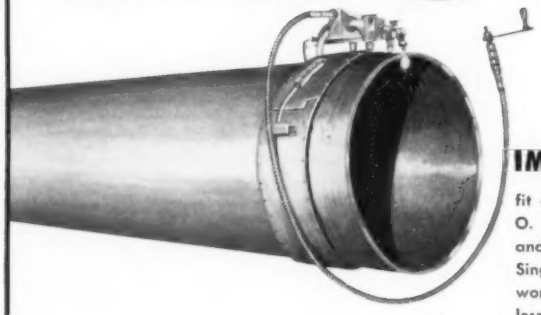
CITIES SERVICE GAS CO., Oklahoma City. Docket G-10956. For 3600-hp additions to Blackwell station, Kay county, Okla.; 115 miles of line in Kansas; 23.5 miles of field pipe for underground storage at Vilas storage field in Wilson and Neosho counties Kan.

MISSISSIPPI RIVER FUEL CORP., St. Louis. Docket G-12061. For 7500-hp additions in four existing stations and 124.5 miles of 26-in. pipe in 10 loops on Mainline 2.

TEXAS EASTERN TRANSMISSION CORP.-PENN-JERSEY TRANSMISSION CORP., Shreveport, La. Dockets G-12226, 12227. For new 10,250-hp compressor station at Mont Belview, Texas; hp additions of 5200 at Gillis, La.; 5280 at Opelousas, La.; 5200 at St. Francisville, La.; 5280 at Union Church, Miss.; 5200 at Clinton, Miss.; 5000 at Kosciusko, Miss.; and 2200 at Linden, N. J. Also 96.5-mile, 30-in. loop between Kosciusko-Uniontown, Pa. and 40 miles of new supply laterals. Penn-Jersey would add following hp in Pennsylvania: 4000 at Delmont, 5000 at Lilly, 5000 at Perulack, 5000 at Grantville, and 5000 at Bechtelsville.

BEVELS 6" PIPE

BEVELS 48" PIPE



C-R-C IMCO BEVELERS

fit all pipe sizes 6" to 48" O. D., cut perfect bevels, and out-of-round pipe, too. Single lightweight unit does work of several, costs you less to buy and use.

CRC

CRUTCHER • ROLFS • CUMMINGS, INC.
HOUSTON, TEXAS
P. O. Box 2073 UNderwood 4-6391
FARMINGTON, NEW MEXICO
P. O. Box 1207 DAvis 5-5523
ARLINGTON, NEW JERSEY
118 Grand Place KEarny 3-4317
IN CANADA: Canadian Equipment Sales & Service Co.
7310 99th St., Edmonton, Alberta, Canada

ONE BEVELING KIT FOR ALL YOUR JOBS!

The CRC IMCO Pipe Beveling Kit contains a complete range of bands for beveling a variety of pipe sizes. With this convenient selection of sizes, the operator need only make one trip to handle all pipe beveling requirements including back beveling. The sturdy steel case and number of bands are optional.

mail to:

CRUTCHER • ROLFS • CUMMINGS, INC.
P. O. BOX 2073 HOUSTON, TEXAS

NAME_____ TITLE_____
COMPANY_____ DIV._____
STREET_____
CITY_____ STATE_____

SEND US LITERATURE ON C-R-C IMCO PIPE BEVELERS

SOUTHERN NATURAL GAS CO., Birmingham. Docket G-12142. For new 5280-hp station at Franklinton, La. and 1320-hp at Olga, La., and 660-hp addition at Gloria. About 60 miles of various size pipe included.

CURRENT CONSTRUCTION

ALBERTA GAS TRUNK LINE CO. LTD., to build 550-mile gathering line in Alberta. 1956 construction consisted of Red Deer river crossing near Bindloss.

EL PASO (TEXAS) NATURAL GAS CO. Docket G-10481 to install 28.1 miles of 10¾-in. line in Nolan and Coke Counties, Texas; install new 1320-hp compressor station at Jameson. Line completed. Work underway on compressor.

KANSAS-NEBRASKA NATURAL GAS CO., Hastings, Neb. Docket G-10014. The 2700-hp additions at five compressor stations have been completed. 32.7 miles of line to get under way this month by Brodie Construction Co. Works calls for 11.5 miles of 12-in., 10 miles of 10-in., 10 miles of 8-in., with 1.2 miles of 6-in. already completed.

MICHIGAN WISCONSIN PIPE LINE CO., Detroit. Docket G-2327 15.5 miles of 4- and 6-in. line to Three Rivers, Mich. under construction; 25 miles of 24-in. in Wisconsin and 18.5 miles of 4-in. in Iowa, Illinois, Wisconsin and Michigan authorized and scheduled for completion this year. All other construction under this docket has been completed and is in operation.

MONTANA-DAKOTA UTILITIES CO., Minneapolis. Docket G-10521. Remaining compressors (two 540-hp at Baker, Mont.) scheduled for installation next summer.

MOUNTAIN FUEL SUPPLY CO., Salt Lake City. Dockets G-10426 and 10446. To build 38 miles of 20-in line and compressors to transport from Sweetwater county in southern Wyoming 60 MMcf/day purchased from Pacific Northwest Pipeline Corp. Also 2640 hp addition at existing compressor station. 5 miles line and compressors completed. Balance pending.

NORTHERN NATURAL GAS CO., Omaha. Dockets G-2399, et al. for 654 miles of line and an additional 12,640 hp in compressor capacity. Also 15-mile 24-in. line from Ogden, Iowa to underground storage near Redfield; 168-mile 20-in. from Twin City area to Duluth and Superior; 92-mile 12-in. and 71-mile 10-in. line in South Dakota and 307 mile of branch lines. Compressor additions and 15-mile line to test Redfield storage project approved. Contracts for compressors and line let to H. B. Zachary, Dresser Engineering Co., Foor Engineering Co., R. H. Fulton & Co., and Pentzien Inc. Newly approved portion includes a total of 354 miles of line and 18,640 hp in compressor capacity broken down as follows: 163-miles extension from Sioux Falls, S. D. area to Aberdeen, S. D. plus 160 miles of branch lines in South Dakota. Not approved is the Duluth-Superior extension.

PACIFIC GAS & ELECTRIC CO., San Francisco. For 83-mile 20-, 18-, and 16-in. line from Beehive Bend field near Willows, Calif., to a point near Davis and then east into Sacramento. About 53 per cent complete.

PERMIAN BASIN PIPELINE Co., Omaha. Dockets G-9688 and 9724. For 19-mile, 16-in. line and 6750-hp compressor station in

Andrews county, Texas, to take gas from Phillips gasoline plant. Gasoline Plant Construction Corp. Houston building compressor station; R. H. Fulton the line.

SOUTHERN CALIFORNIA and SOUTHERN COUNTIES GAS CO., Los Angeles. A 241-mile 30-in. line from Newhall, Calif. to Colorado river near Needles to meet El Paso Natural line from San Juan and Permian basins. R. H. Fulton & Co., Lubbock, Texas, started construction in January. Completion scheduled for June 1957. Four 2000-hp compressors will be installed at new station near Needles. Schedule to begin operation in November.

TEXAS EASTERN TRANSMISSION CORP., Shreveport. Dockets G-2503, 9784-87. 422 miles of 30-in. line near Mexican border to transport gas to Texas Eastern's Vidor, Texas station; approximately 45 miles of 24-in. pipe connecting TET's existing line near Provident City, Texas, to the new line; pipeline loops totaling about 77 miles at various locations along existing 30-in. system; approximately 147 miles of supply and sales laterals; new and additional compression facilities totaling 32,250 hp; and approximately 20 sales measuring and regulating stations.

TRANS-CANADA PIPE LINES LTD., for 2287-mile gas line taking Alberta gas from Alberta - Saskatchewan border to Toronto and Montreal, with lateral from Winnipeg to Emerson, Man., 34-in. line from Alberta border to Winnipeg under construction. 30-in. from Winnipeg to Toronto; 24- and 20-in. from Toronto to Montreal; 24-in. from Winnipeg to Emerson; 10 compressor stations totaling 105,000 hp. First four sections of line under contract to Majestic Contractors Ltd., Mannix Ltd., Canadian Bechtel Ltd., and Dutton-Williams Brothers. By November, 230 miles of 34-in. had been ditched.

WASHINGTON (D.C.) GAS LIGHT CO. Docket G-10090 for 26.1-mile, 24-in. line from Dranesville, Va. to a point near Washington. Work nearly completed.

WESTCOAST TRANSMISSION CO. LTD., Calgary. To build 650-mile, 30-in. line from Peace river area to near Vancouver, B. C., to connect with line of Pacific Northwest Pipeline Corp., to transport 400 MMcf daily, of which 300 MMcf is to be delivered to PNW. 400 miles of line installed and ready for testing. Scheduled for completion in fall of 1957.

Approved

PENNSYLVANIA GAS CO., Warren, Pa. Docket G-10098 for 23 miles of 10-in. line in Erie county, Pa., and 15 miles of 8-in. in Warren and Chautauqua counties to make gas service available to communities from Union City to Fairview, Pa.

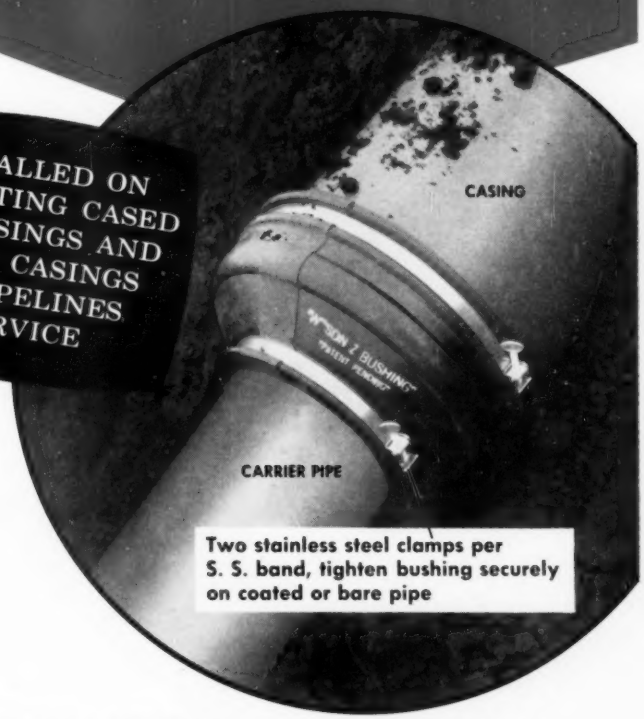
SOUTHERN NATURAL GAS CO., Birmingham. Docket G-11234 for 10.5 miles of 10⅝-in. line, including submarine crossing of Mississippi river; two measuring stations; two 660-hp compressor units of Toca station; one 550-hp addition at White Castle station; and one 1350-hp unit at Gwinville.

TEXAS ILLINOIS NATURAL GAS PIPELINE CO., Chicago. Docket 11433 for 9.5 miles of 36-in. to loop single 30-incher from a point on the north bank of the Illinois river to the Joliet regulator station.

They Go Together...

WmSEAL SPLICED "Z" BUSHINGS* for PIPELINES IN OPERATION

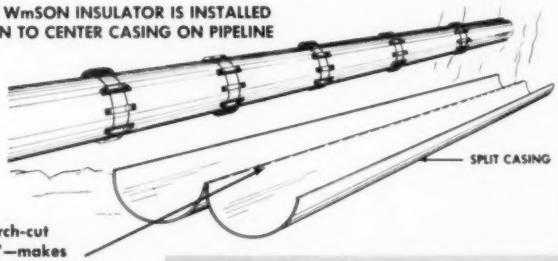
*INSTALLED ON EXISTING CASED CROSSINGS AND SPLIT CASINGS ON PIPELINES IN SERVICE



Two stainless steel clamps per S. S. band, tighten bushing securely on coated or bare pipe

HERE'S AN EASY WAY TO INSTALL CASINGS ON LINES IN SERVICE

EVERY OTHER WmSON INSULATOR IS INSTALLED UP-SIDE-DOWN TO CENTER CASING ON PIPELINE



Interrupted torch-cut forms "hinge"—makes lineup easy for welding around pipe

Improved spliced "Z" Bushings are complete with easy to apply cold patch kit.

Write for bulletin

T. D. Williamson, Inc.

P. O. BOX 4038 TULSA 9, OKLAHOMA

REPRESENTATIVES: HOUSTON · AMARILLO · PITTSBURGH · PLAINFIELD, N. J. · JOLIET, ILL. · JACKSON, MICH. · LOS ANGELES · SAN FRANCISCO BARTLESVILLE, OKLA. · SEATTLE · EDMONTON · TORONTO · CALGARY VANCOUVER · BUENOS AIRES · CABIMAS, ZULIA, VENEZUELA · DURBAN, NATAL, SOUTH AFRICA · PARIS, FRANCE · SIDNEY, AUSTRALIA

Two 40-ft sections of 34-in. pipe are being joined at the outside weld by the new automatic electric welding process. The pipe is turned on rubber-surfaced rollers and outside sealer and cover beads are applied. Back-up clamp inside the pipe prevents burn-throughs.

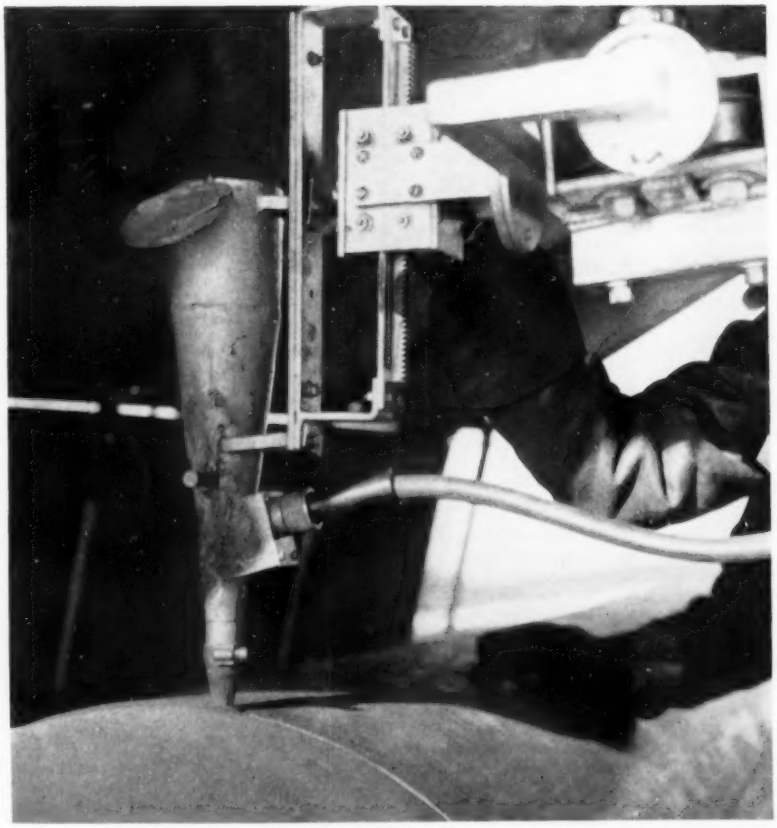
Automatic welding speeds Canadian line

THE first completely automatic electric welding process used in pipeline double-jointing operations is helping speed construction on the Trans-Canada Pipe Line from Alberta to eastern Canada.

Price-Poole, pipeline constructors, are using the new process in double-joint yard operations on their 99-mile spread in Manitoba. With the process, one-half of the manual welding required during construction is eliminated and welding is carried on without difficulty in temperatures down to 40° below zero. Welds have stood up under the most vigorous tests and examinations for flaws, including X-ray.

Barney Elliott and Don Barchus of H. C. Price Co., Bartlesville, Okla. developed the new process. Although semi-automatic electric welding has been used during recent years, this new process is the first that is fully automatic. Elliott and Barchus either developed their own equipment or adapted standard equipment to their special requirements.

The 40-ft lengths of 34-in. pipe are carried to the double-joint rack, developed by M. J. Crose Manufacturing Co., Tulsa, and H. C. Price. In the first operation, a



Both the external and internal welding heads remain stationary during the welding process. Qualification tests were made in January when the thermometer hovered at 24° below zero. Even under these extreme conditions, the welds passed qualification tests with flying colors.

OIC VALVES

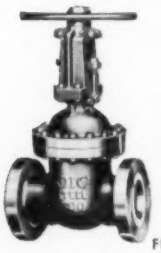
MOST COMPLETE MODERN LINE . . .

BRONZE

FIG. 520 FIG. 7100

Featuring union type, body-bonnet joint. ⅛″ to 3″. 125, 150, 200, 300 and 350 WSP; 200 to 2,500 WOG.

DURABLE AND SAFE . . .



CAST STEEL

FIG. 3002 FIG. 1572

Excellent for higher temperatures and pressures. 2″ to 16″. 150, 300 and 600 lb. primary pressure series.

29 TYPES, 9 TRIM VARIATIONS . . .

IRON

FIG. 1140 FIG. 124 FIG. 333

Includes end-seated seat rings for streamlined flow and longer service. 1¼″ to 16″. 125, 150 and 250 WSP; 175, 200, 400 and 500 WOG. ¼″ to 4″ U-Bolt gates.

1000 BRINELL DURACASE TRIM . . .

FORGED STEEL

FIG. 1021 FIG. 1321 FIG. 1720

Extra-hard, duracase trim, plus your choice of bolted or union type, body-bonnet joint. ¼″ to 2″ gate, globe, angle, check; 600 lb. primary pressure series.

TRIPLE-SEALED AGAINST LEAKS...

LUBRICATED PLUG VALVES

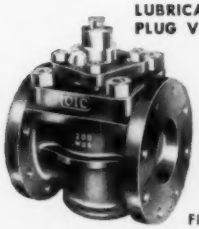


FIG. CR-212

Exclusive design ends shank leakage, holds adjustment, reduces maintenance. ½″ to 12″. Iron, 175 psi to 800 psi working pressures. Cast steel, ASA 150 lb. and 300 lb. pressure classes.

Write for the OIC valve cross reference booklet. It compares valves of 15 manufacturers. Request also new specification literature on the valve lines of your choice.

THE OHIO INJECTOR COMPANY

Wadsworth, Ohio

OIC VALVES

FORGED & CAST STEEL, LUBRICATED PLUG, BRONZE & IRON VALVES

A specially designed gantry boom, which carries an automatic welding head and an operator, rides inside the pipe. As in the case of the outside welds, the inside welding head remains stationary as the pipe is revolved.

Specially adapted beveling machines are used in the double-jointing yard. The machines revolve on an axle placed in the 34-in. pipe.

land in the pipe is made 3/16 in. above the factory land, to accommodate the automatic sealer bead weld. A double beveling machine—specially built for this operation—revolves around the butt ends of the pipe from a special axle.

The two sections of pipe are then placed on the double-jointing machine. A hydraulic internal line-up clamp holds the ends together in perfect alignment. Two welding tacks, 2½ in. long, are made while the clamp is in place to hold the pipe in line until the automatic welder takes over. The pipe rests on rubber-surfaced rollers which automatically revolve the pipe when the automatic welding head is lowered and the operation started.

The automatic welding unit applies the first pass — the sealer bead—followed by a cap-out or cover bead. All outside welding is done against a backup clamp inside the pipe to prevent burn-throughs.

When the cover bead is completed, the clamp is removed. The pipe, now an 80-ft length, is rolled to the next set of turning rolls. Here the inside or backup bead is applied. The inside weld is made from a specially developed gantry boom which rides inside the pipe, complete with automatic welding head and an operator lying on a fixed platform.

Both the external and internal welding heads (adapted Lincolnweld ML-2s) remain stationary during the welding process. A complete weld takes seven minutes to complete.

After the internal weld has been completed, the 80-ft length is rolled along the skids, X-rayed and then trucked to the right-of-way.

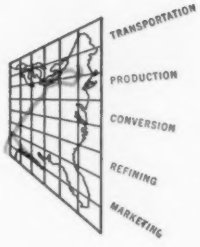
Power supply for the Price-O-Matic Pipe Welder is housed in a workshop in a mobile trailer. Equipment includes three 600-amp SAE Lincoln motor generator sets and a 75-kw Caterpillar generator. The double-joint rack can be taken down in short order, loaded on a lowboy, and then low-boy and trailer towed to the next location. ■

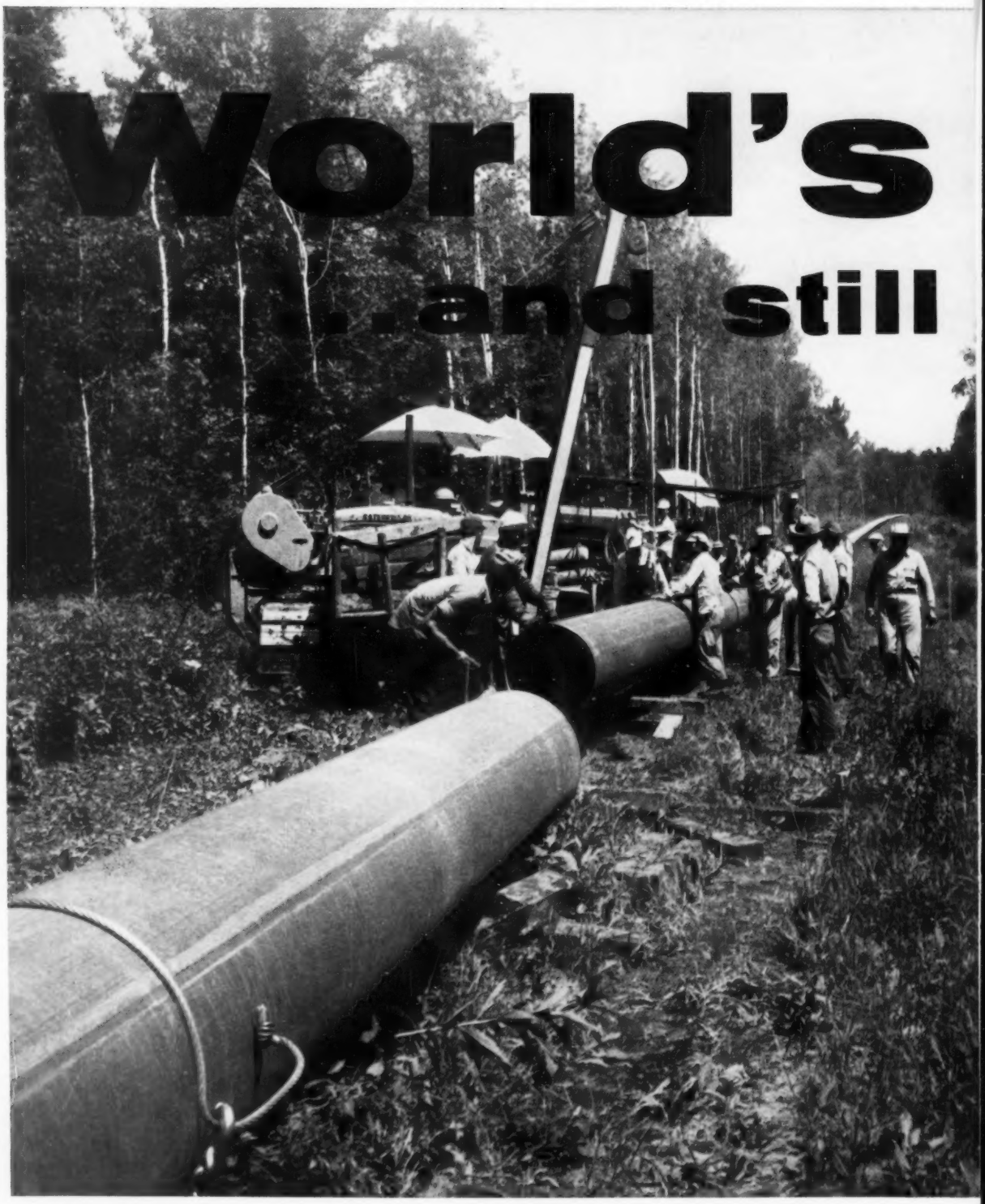
Additional photos appear on page 167

PRIME SOURCE

The humming bird seeks the flower for food.
So fuel-hungry America looks to natural gas and oil for energy.
To fuel its furnaces, drive its cars, heat its homes, cook its food.
Today Tennessee Gas, operator of the nation's longest pipeline, also
is active in other basic phases of gas and oil . . . exploration, production . . .
extraction, conversion . . . refining, marketing. Fully equipped to
help supply the services and products that mean better living.

TENNESSEE GAS TRANSMISSION COMPANY
AMERICA'S LEADING TRANSPORTER OF NATURAL GAS
HOUSTON, TEXAS





Interprovincial has extended their system from Superior to Sarnia and now from Sarnia to Port Credit, Ontario by the end of this year. It will then include over 3,000 miles of main line and loops. A. O. Smith's contribution to the system will be just above 50% of the total line laid.

longest growing!

Interprovincial Pipe Line Company has 1,774 miles of main line now in service . . . will extend this system another 156 miles during '57

THIS is the big crude oil carrier from Edmonton, Alberta, to refineries in the Prairie Provinces and Ontario in Canada . . . Minnesota, Wisconsin and Michigan in the U. S. Spanning 1,774 miles, it's already the world's longest line of this type and construction is now under way that will increase main line length to over 1,900 miles.

A. O. Smith is proud to have been a part of this great system since the original main line of 1129 miles was constructed in 1950. Over 70% of this original line to Superior, Wisconsin was supplied by A. O. Smith. Since that time from both Milwaukee and Houston mills, A. O. Smith has supplied most of the pipe for the looping work done on this original section in 1953, 1954, 1956 and 1957.

Map shows the complete system of main and looping lines as it will be when this year's construction is completed.

On the current project, A. O. Smith is supplying pipe for the looping lines being built near Glenavon and between Clearbrook and Superior.

For almost 30 years...

A. O. Smith line pipe has always been manufactured to a high standard of quality . . . precisely-controlled at every step of production. That's why A. O. Smith pipe, made and installed in 1928, is still in operation. That's why so much A. O. Smith pipe is in nearly every important high-pressure line.

Through research ... *a better way*

A.O.Smith
CORPORATION

TUBULAR PRODUCTS DIVISION

Milwaukee 1, Wisconsin

Chicago 4 • Dallas 2 • Houston 2 • Los Angeles 17 • Midland 5, Texas • New Orleans 12 • New York 17 • San Francisco 4 • Seattle 1 • Tulsa 3 • Washington 6, D. C.

International Division: Milwaukee 1, Wisconsin

to your pipeline contract

When River is on the job you get the plus value of over 20 years experience in building pipelines of all sizes in all kinds of terrain and weather.
From this experience comes the planning, equipment and trained crews needed to get the job done right and on time.
River experience has licked mountains and plains . . . lakes, rivers and deserts.

Put River to work on your contract and watch the job finished on time.
River is just the right size . . . big enough to handle any job . . .
small enough to give your contract the personal attention it deserves.

River CONSTRUCTION CORPORATION

Robert Thomas
J. C. Briscoe
J. C. Minyard

GENERAL OFFICES: 4837 WEST FREEWAY, P. O. BOX 9127 • FORT WORTH, TEXAS

Wholly Owned Subsidiary: RIVER CONSTRUCTION CORP., LTD., 580 Hornby, Vancouver, British Columbia, Canada

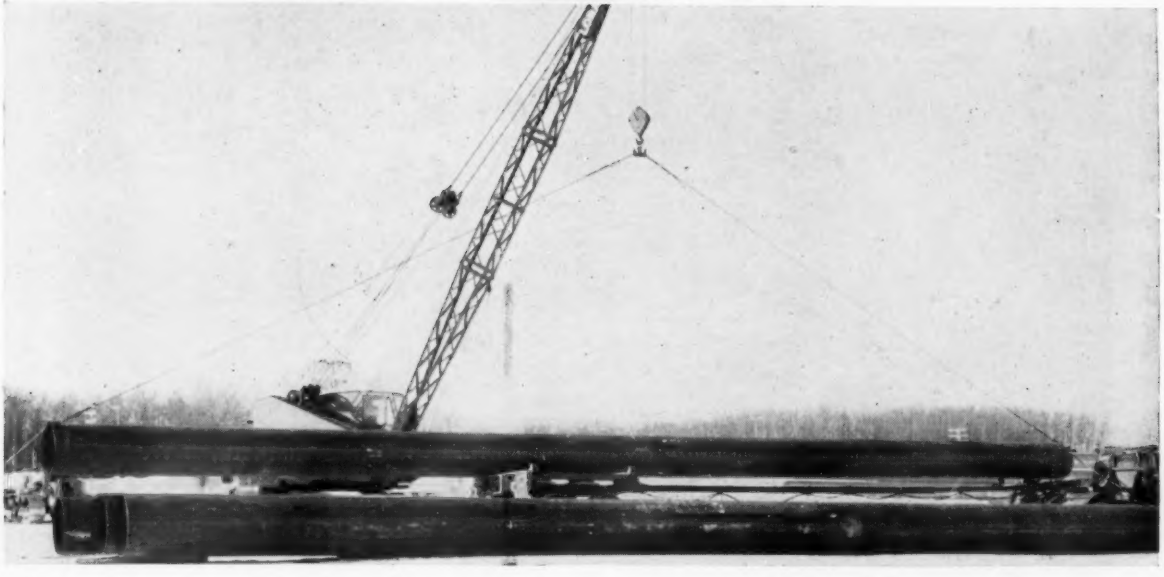
(*Continued from page* 162)

Portable power house includes a workshop, three 600-amp motor generator sets and a 75-kw diesel generator. When the double-joint yard is to be moved, the double-joint rack is packed on a lowboy, the power house is hooked to a trailer and both are ready to move on.

Automatic welding...

Both outside and inside welds made by the completely automatic welding process are X-rayed. At left, the X-ray camera is being taken from a double joint.

Eighty-foot lengths of pipe are loaded on a trailer truck for delivery to the right-of-way. The fully automatic process has enabled the contractors to complete a large part of their welding regardless of sub-zero temperatures, will cut line welding by a reported 50 per cent, and will contribute to a quick start of all-out construction this spring.



NORDBERG

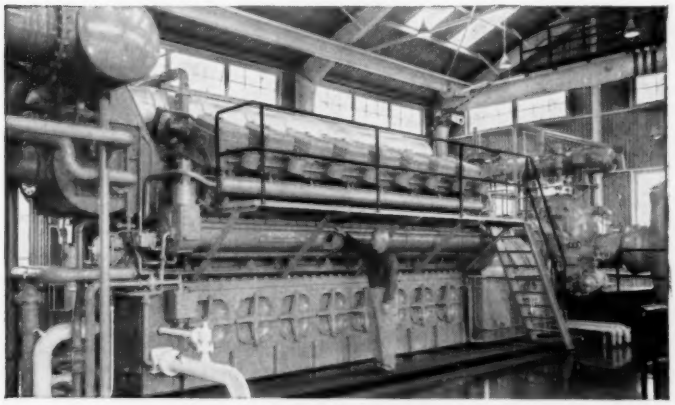
MEMO TO: Management
After investigation and full consideration of all facts this committee recommends the installation of Nordberg engines for this pipeline project.
Chairman, Technical Committee
Dick Carlton

The Scene: Office of the Vice President in Charge of Operations, major gas transmission company.

The Problem: Selection of engine compressor units for gas pipeline expansion.

Recommendation: Install Nordberg *Supairthermal*® gas engine gear sets driving centrifugal gas compressors.

The Reason: Because the Nordberg units can be installed with lower capital investment, and operated at lower cost per horsepower-hour.



Nordberg Supairthermal Engines are, by all standards, your best investment in modern prime movers for compact, economical, long term pipeline power. These powerful engines are built in both In-line and V-types, in sizes from 500 to 4,500 horsepower for Diesel, Duafuel® or Spark-Ignition Gas operation.

Consult Nordberg on your next expansion program.

NORDBERG MFG. CO., Milwaukee, Wisconsin

NORDBERG

DIESEL • DUAFUEL® AND SPARK-IGNITION GAS ENGINES

©1957, Nordberg Mfg. Co.

O157-R

GAS pipeline news

Reserves up 14.1 trillion cu ft in '56 for biggest recorded gain

NATURAL gas reserves increased 14.1 trillion cu ft in 1956, the biggest gain ever recorded. According to the joint report from the American Gas Association and the American Petroleum Institute, there are 237.8 trillion cu ft of proved recoverable gas reserves in the U. S.

The previous record one-year gain was 12.8 trillion cu ft, reported for 1946. Over the past 10 years, the average annual gain has been 7.7 trillion.

Natural gas net production climbed to a record 10.9 trillion cu ft last year. This peak production, however, consumed only 44 per cent of the 25 trillion cu ft added to reserves in 1956 through new discoveries, plus extensions and revisions of earlier estimates. The previous net production record of 10.1 trillion cu ft was in 1955.

Texas accounts for nearly half the nation's production and reserves. Its production of 5.3 trillion cu ft was 48.9 per cent of the U. S. total. Texas' reserves at the end of the year were 112.7 trillion cu ft, more than 47 per cent of the total for the country.

Thirty states are included in the reserves and production report. But Texas and five other states—Louisiana, New Mexico, Kansas, Oklahoma, and California — represent approximately 93 per cent of total reserves and 91 per cent of last year's production.

Following Texas in reserves—in terms of trillions of cu ft—are Louisiana, 45.1; New Mexico, 23.5; Kansas, 17.6; Oklahoma, 13.8; and California, 8.8.

Leading states after Texas in 1956 production are (billions of cubic feet): Louisiana, 1922; Oklahoma, 917; New Mexico, 642; Kansas, 578; and California, 488.

Pennsylvania led all states in the amount of gas held in underground storage with 326 billion cu ft. Ohio came next with 283 billion. Michigan, with 234 billion, and West Virginia, with 209 billion, followed.

Proved reserves of crude oil for the year ending Dec. 31, 1956, were estimated at 30.4 billion bbl, up 422 million bbl over the 1955 peak. Natural gas liquids totaled 5.9 billion bbl, up 464 million bbl. Total liquid hydrocarbons (crude oil and natural gas liquids) showed a net increase of 886 million bbl over 1955, reaching 36.3 billion bbl in 1956.

* * *

Tables on this and the following page show reserves for 1956 and for the 1945-56 period.

ESTIMATED PROVED RECOVERABLE RESERVES OF NATURAL GAS IN THE UNITED STATES

(Millions of Cubic Feet—14.65 psia, at 60° F)

	Reserves As of Dec. 31, 1955[b] (1)	Extensions and Revisions[b] (2)	Discoveries of New Fields and New Pools In Old Fields[b] (3)	Net Change in Underground Storage[c] (4)	Net Production[d] (5)	Reserves[b] as of Dec. 31, 1956: Total (Columns 7 + 8 + 9 + 10, Also Columns 1 + 2 + 3 + 4 Less Column 5) (6)	Non-Associated[e] (7)	Associated[f] (8)	Dissolved[g] (9)	Underground Storage[h] (10)
Arkansas	1,164,367	2,990	38,457	(−) 551	33,736	1,171,527	554,908	323,260	288,762	4,597
California[j]	8,892,950	258,495	76,317	11,264	487,793	8,751,233	2,164,272	2,058,459	4,462,694	65,808
Colorado	2,253,562	187,523	73,161	3,291	94,768	2,422,769	1,611,749	131,977	675,752	3,291
Illinois	233,565	2,574	1,395	7,180	25,009	219,705	5,535	500	186,026	27,644
Indiana	33,111	4,289	0	477	4,105	33,772	2,050	1,880	22,621	7,221
Kansas	16,293,080	1,652,569	195,316	3,042	577,750	17,566,257	17,022,526	146,698	340,400	56,633
Kentucky	1,262,270	46,051	7,600	1,681	72,000	1,245,602	1,161,206	0	62,617	21,779
Louisiana[j]	42,435,592	2,910,172	1,630,589	0	1,922,354	45,053,999	35,490,462	6,548,729	3,014,808	0
Michigan	325,874	4,562	15,377	27,995	12,022	361,786	45,596	20,680	61,418	234,092
Mississippi	2,608,340	(−)29,648	43,592	1,273	220,231	2,403,326	1,627,795	500,852	272,464	2,215
Montana	719,719	6,094	718	438	30,618	696,351	549,031	36,203	80,336	30,781
Nebraska	203,421	39,174	8,182	0	25,375	225,402	121,487	12,608	91,307	0
New Mexico	18,584,912	5,222,559	340,232	(−) 33,116	641,880	23,472,707	17,052,725	4,694,721	1,673,733	51,528
New York	75,760	5,127	1,420	6,877	3,935	85,249	37,024	0	287	47,938
North Dakota	280,696	112,270	20,512	0	15,985	397,493	6,307	0	391,186	0
Ohio	809,874	39,845	6,390	29,225	31,727	853,607	532,226	0	37,960	283,421
Oklahoma	13,204,739	1,249,397	234,480	3,035	916,602	13,775,049	6,483,823	3,432,600	3,768,640	89,986
Pennsylvania	754,389	97,573	9,915	32,751	118,416	776,212	419,111	0	31,165	325,936
Texas[j]	108,287,548	6,944,630	2,829,100	2,423	5,334,951	112,728,750	70,801,507	25,580,088	16,329,920	17,235
Utah	420,896	170,461	46,949	0	18,520	619,786	546,361	19,075	54,350	0
Virginia	34,756	2,813	937	0	2,949	35,557	35,557	0	0	0
West Virginia	1,564,899	121,564	25,250	32,995	182,971	1,561,737	1,288,602	0	64,033	209,102
Wyoming	3,196,103	152,232	16,932	(−) 199	129,136	3,235,932	2,416,326	186,729	614,658	18,219
Miscellaneous[a]	57,022	11,288	13,655	3,889	5,093	80,761	56,727	0	19,225	4,809
TOTAL	**223,697,445**	**19,214,604**	**5,636,476**	**133,970**	**10,907,926**	**237,774,569**	**160,032,913**	**43,695,059**	**32,544,362**	**1,502,235**

a. Includes Alabama, Arizona, Florida, Iowa, Maryland, Missouri and Nevada.

b. Excludes gas loss due to natural gas liquids recovery.

c. The net difference between gas stored in and gas withdrawn from underground storage reservoirs, inclusive of adjustments and native gas transferred from other reserve categories.

d. Net production equals gross withdrawals less gas injected into producing reservoirs. Changes in underground storage and gas loss due to natural gas liquids recovery are excluded. Fourth quarter production estimated in some instances.

e. Non-Associated Gas is free gas not in contact with crude oil in the reservoir; and free gas in contact with oil where the production of such gas is not significantly affected by the production of crude oil.

f. Associated Gas is free gas in contact with crude oil in the reservoir where the production of such gas is significantly affected by the production of crude oil.

g. Dissolved gas is gas in solution with crude oil in the reservoirs.

h. Gas held in underground reservoirs (including native and net injected gas) for storage purposes.

j. Includes off-shore reserves.

SUMMARY OF ANNUAL ESTIMATES OF NATURAL GAS RESERVES FOR PERIOD DEC. 31, 1945 TO DEC. 31, 1956

(Millions of Cubic Feet—14.65 psia, at 60° F)

Year	Natural Gas Added During Year: Extensions and Revisions	Natural Gas Added During Year: Discoveries of New Fields and New Pools in Old Fields	Natural Gas Added During Year: Total of Discoveries, Revisions and Extensions	Net Change in Underground Storage	Net Production During Year	Estimated Proved Reserves as of End of Year	Increase Over Previous Year
1945	—	—	—	—	—	147,789,367	—
1946	[a]	[a]	17,729,152	[a]	4,942,617	160,575,901	12,786,534
1947	7,570,654	3,410,170	10,980,824	[a]	5,629,811	165,926,914	5,351,013
1948	9,769,483	4,129,089	13,898,572	51,482	6,007,628	173,869,340	7,942,426
1949	8,061,429	4,612,870	12,674,299	82,746	6,245,041	180,381,344	6,512,004
1950	9,172,381	2,877,351	12,049,732	54,301	6,892,678	185,592,699	5,211,355
1951	13,013,606	3,039,385	16,052,991	132,751	7,966,941	193,811,500	8,218,801
1952	8,934,470	5,411,043	14,345,513	198,850	8,639,638	199,716,225	5,904,725
1953	13,371,355	7,081,661	20,453,016	516,431[b]	9,238,540	211,447,132	11,730,907
1954	4,632,309	4,966,894	9,599,203	90,906	9,426,509	211,710,732	263,600
1955	16,298,125	5,719,069	22,017,194	87,637	10,118,118	223,697,445	11,986,713
1956	19,214,604	5,636,476	24,851,080	133,970	10,907,926	237,774,569	14,077,124

a. Not estimated.

b. All native gas in storage reservoirs formerly classified as a natural gas reserve is included in this figure.

New barge designed for offshore pipelaying

The Gulf Coast's multi-billion dollar offshore oil and gas industry moved into a new phase recently with the launching of the first vessel specifically designed and built for the tough job of laying pipelines in the Gulf of Mexico.

The barge, named "Magic," belongs to Commonwealth Oil Co. The ultra-modern, $750,000 craft has specially designed machinery and equipment plus luxurious air conditioned quarters for its skilled personnel and crew.

Specifications for the "Magic" were drawn by Robert C. Ledford, vice president of Marine Gathering Co., a wholly owned subsidiary of Commonwealth, which will operate the barge.

The 260-ft long and 50-ft wide barge was designed and constructed to American Bureau of Shipping standards and has Coast Guard approval.

A tug will tow the barge to each project, either at the shore end of the pipeline or at the producing platform offshore.

Mounted on the barge is a ramp running the full length of the 260-ft vessel, on which all of the various joint welding and waterproofing operations take place. On each side of the ramp is a 35-ton crane for lifting pipe sections into place. Under the ramp are the equipment rooms. At the extreme forward end of the Magic are two decks of crew quarters topped by the captain's bridge.

From the bridge, the Magic's captain will pull the vessel along in a "bootstrap" operation by means of anchors at each of the four corners of the barge and special winches to operate the anchor cables. A tug will drop the barge anchors well in front of and behind the pipelaying vessel. Then, by pulling in on the forward anchors and letting out on the aft ones, the captain will move the barge forward. The tug will operate around the barge continually, repositioning the anchors. With two anchors at each corner and only one being moved at a time, the barge will be held firmly in position at all times.

A ballasting system in the 13½-ft high hull permits the barge to draw as little as 4 ft of water near the shore and as much as 8 ft in deep water, where the additional draft will contribute to stability. The hull is crosshatched into small watertight compartments to increase its seaworthiness. Cathodic protection is used to eliminate corrosion of the hull.

At the nearest point ashore, a radio-equipped house trailer, fitted as a personnel and material procurement office, will be stationed.

Normal complement for the Magic will be 46 men. Two shifts of pipeline workers will each include a ramp foreman, six welders, six helpers, a crane operator, two swampers and an X-ray technician to check all welded joints. By having two crews, the barge can operate on a 24-hr basis.

Housed under the ramp will be an air conditioned X-ray developing room, tool room, shop, main switchboard, and electrical equipment.

The barge is capable of laying 2000 ft of large diameter pipe or 5000 ft of small diameter pipe during each 24-hr period, taking bad weather and routine mechanical shutdowns into account.

In actual operation, the barge moves 40 ft, the length of one section of pipe, at a time. From a smaller supply barge tied alongside the Magic, the 95-foot boom of one of the giant cranes lifts a section of pipe into place. Except for a small length at each end left open for welding joints, the pipe comes already coated with corrosion resistant materials and covered with a heavy sheath of mesh-reinforced concrete. This is used both to weight down the pipe and to protect it from corrosion and marine life.

That portion of the pipeline that is already completed trails off the stern of the barge into the water. As the barge moves forward, the pipe is lowered to the bottom or into a ditch already dredged along the ocean floor.

The new section is hoisted into place at the end of the pipeline at the top of the ramp. Then, the stringer bead is welded around the joint. Following this, the barge moves forward and the first joint is passed 40 ft down the ramp where the hot pass weld is applied. Instead of sliding down the ramp, the pipe actually rides smoothly on pairs of automobile tires, which are mounted on the ramp in such a way that they can turn freely.

Meanwhile, another section of

THE WELDER'S

Republic

THE TWO FRIENDS—SHIELD AND PIPE—are vital in the installation of a good pipe line. The importance of the welder's shield is obvious. So is the need for uniformly thick walls for speed welding without costly delays. You get this—and more—with Republic Electric Resistance Weld Line Pipe.

REPUBLIC

REPUBLIC STEEL

World's Widest Range of Standard Steels

BEST FRIEND!

Electric Weld Line Pipe

Just as welders *know* they can rely on the dependability of their protective head shield, so it is with the dependability of Republic Electric Resistance Weld Line Pipe.

They know that every joint is uniformly concentric, permitting accurate line-up for immediate welding. They know that walls are uniformly thick with no thin spots to worry about—that every joint can be welded at top speed without the danger of costly burn-throughs.

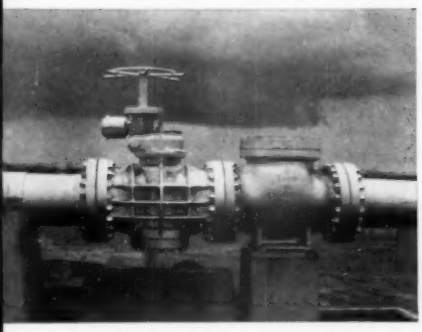
One reason for this is our method of manufacture. Every joint is formed from flat rolled steel, carefully checked for uniform thickness from edge to edge and end to end. Both surfaces are visually inspected to make certain they are free from valve-clogging scale and trouble-causing defects. The pipe is then formed and permanently joined by the Electric Resistance Weld method—pioneered by Republic Steel.

High ductility is built in to assure smooth, uniform bends. So is uniform high-yield strength to permit the building of high-pressure lines. And all joints are pressure-tested to make absolutely certain of complete dependability in service.

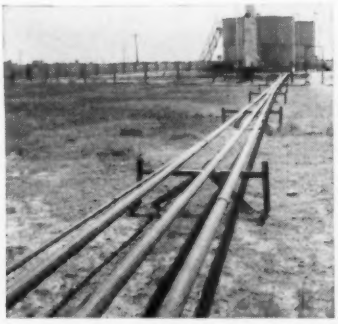
You'll save installation time and money—be sure of a quality job when you specify Republic Electric Resistance Weld Line Pipe. It's available in sizes 2⅜" through 16" O.D. Republic also makes big-diameter Fusion Weld—sizes 24" through 30" O.D., Continuous Butt Weld in sizes ⅛" through 4" nominal, and Plastic Pipe in flexible and semi-rigid types.

If you have a transmission, gathering, distribution, and product-line problem, call us. Or send coupon for descriptive literature.

HERE ARE MORE REPUBLIC PRODUCTS USED IN THE OIL AND GAS INDUSTRY



REPUBLIC ALLOY STUDS are widely used in the oil and gas industry. We make and stock over 20,000 regular items for all fastening needs. Clean, accurate threads provide maximum holding power, resistance to wear and trouble-free backoff for maintenance. Specify Republic fasteners on your next order.



REPUBLIC CONTINUOUS BUTT WELD PIPE has been a standard in the oil and gas industry for years. It's used for gathering lines, distribution and general maintenance work, offers many features. Uniform ductility and strength; tight adherence of the galvanized coating; ease of threading, bending and welding. Available in economical double-random lengths. Call your Republic Pipe Distributor.

REPUBLIC CHAIN has a variety of uses in the oil and gas industry—from binding casing or line pipe for trucking to the job site—to hauling, hoisting and towing. Republic makes boomer chain, spinning chain, in fact, chain for every conceivable requirement, including truck and tractor chains. Coast-to-coast warehousing assures prompt delivery.

STEEL

and Steel Products

REPUBLIC STEEL CORPORATION
Dept. C-3154
3134 East 45th St., Cleveland 27, Ohio

Please send literature on Republic Line Pipe:

☐ Resistance Weld ☐ Continuous Butt Weld ☐ Fusion Weld ☐ Fasteners ☐ Chain

Name_____ Title_____

Company_____

Address_____

City_____ Zone____ State_____

pipe has swung into place at the top of the incline so that work is going on simultaneously at all five stations along the ramp.

Two welder-helper teams are stationed at the third position on the ramp, one to apply the filler weld and the other to put on the cap weld.

At the fourth station, an X-ray photograph is taken of the joint to make certain that it meets the rigid submarine requirements. Then, while the joint is being wrapped with polyvinyl tape for corrosion and water resistance, the X-ray plate is rushed to the lab for developing.

The fifth station is next for the joint. Here it is covered with a flexible form and filled with concrete even with that on the adjoining pipe.

When the barge moves once more, the finished section slides gently into the water.

The Magic is part of a unique seagoing fleet, which includes a crew boat for transporting personnel to and from the barge, an electronically directed buoy boat for dropping markers that set the line for the pipe, a tug to bring loaded pipe barges and remove empty ones, the pipe barges, and a second tug to reposition the anchors as soon as the barge moves forward.

New gas well pipe developed in France

French gas producers are claiming to have developed a completely new type of gas well pipe which is stronger, larger, and completely water and gas tight.

Last fall, the new type of piping was sunk into a 12,800-ft well in the huge gas field near Lacq and has since proven a "tremendous" improvement over older type piping.

The new pipe has a 7-in. diameter with original water-tight joints called "LX." It has proven completely gas-tight in underwater tests with nitrogen at a pressure of 1540 lb/sq ft and a traction resistance of about 550 tons, the developers say.

This compares with traditional joints normally used in gas well piping which have an average resistance of only 310 tons and are not gas-tight under high pressure, according to the French.

The new type piping is produced at the Auzin plant of the Société Lorraine-Escaut.

Threading of the joints, an extremely precise operation, is done by using a semi-automatic lathe developed specially for threading tubular products.

By using the new piping, the French will attempt to replace present double column $2\frac{3}{8}$- and 4-in. pipes with a single column of $3\frac{1}{2}$-in. pipe. The water- and gas-tight 7-in. casing should reduce drilling dangers, they say.

FPC consolidates 20 competitive applications

Twenty competing applications for service to the Midwest have been combined into one giant case by the Federal Power Commission.

Although the consolidation was officially described as merely a streamlining step, an industry spokesman claimed the move actually is a major victory for Midwestern Gas Transmission Co., Houston. Midwestern, a Tennessee Gas Transmission Co. affiliate, wants to build a $103-million pipeline, extending 2000 miles from Emerson, Manitoba, near the U.S.-Canadian border, to Portland, Tenn. If its plan is approved, Midwestern would become a new competitor for gas customers in the midwestern states.

Three other companies, in an effort to head off this possibility, have asked the FPC for permission to expand their own systems. Michigan Wisconsin Pipe Line Co., Northern Natural Gas Co., and Natural Gas Co. of America are the companies whose applications compete directly with Midwestern.

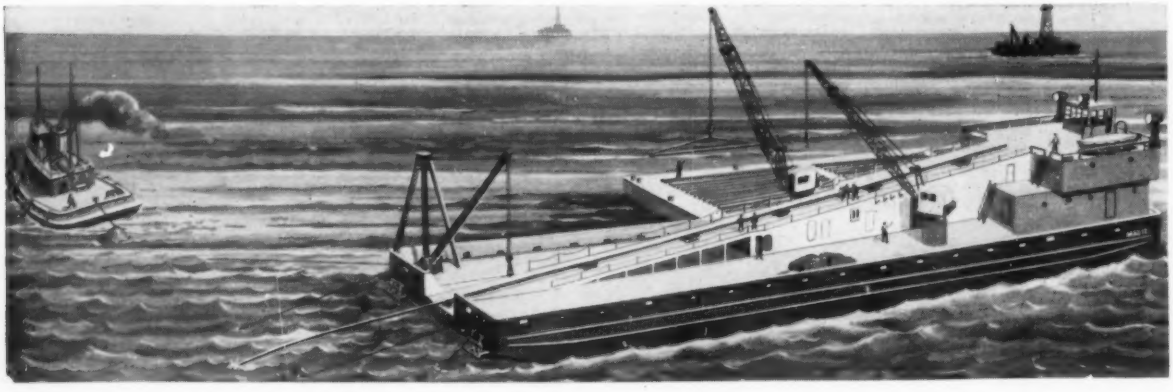
As one official put it, "If the FPC grants any one of these proposals, the others would be jeopardized. That's why it's consolidating the individual cases into one big proceeding."

Hearings are scheduled to begin May 14. Applications of five other companies are also affected by the consolidation. They are: American Louisiana Pipe Line Co., El Paso Natural Gas Co., Permian Basin Pipeline Co., Iron Ranges Natural Gas Co., and Tennessee Gas Transmission.

Tennessee Gas amends applications on file

Tennessee Gas Transmission Co., Houston, seeks to amend two applications already on file with the FPC. Tennessee wants to revise the construction and in-service schedules of Dockets G-9454 and 11107.

Now, under Docket 11107, TGT's 1957 program would include 176 miles of line; 37,260 new and additional compressor horsepower in Louisiana, Mississippi, Tennessee, and Kentucky; and a submarine crossing of the Mississippi. An ad-



Artist's conception of the "Magic" shows how the specially designed pipe-laying barge will operate.

ditional average daily sales capacity of 118,137,000 cu ft would be provided at a cost of $39.7 million.

The second phase of this docket, slated for 1958, includes 896 miles of varying diameter pipe and 83,730 hp in new and existing compressor stations in Mississippi, Tennessee, New York, Pennsylvania, Kentucky and Ohio. Estimated to cost $135.3 million, the plan will increase Tennessee's capacity 338,271,000 cu ft/day.

In Docket 9454, TGT proposes 36,390 hp additions to stations in Texas, Mississippi, Louisiana and Texas. Cost is about $11.9 million. These facilities would provide the same increase as originally planned, 115,293,000 cu ft. TGT's estimated peak day deliverability, including gas storage deliverability, would be upped to 2,886,076,000 cu ft.

Tennessee still proposes (as part of Docket 9454) to sell up to 204 MMcf/day to Midwestern Gas Transmission Co.

Depletion allowance cut proposed in Congress

One of the strongest drives of recent years to reduce the depletion allowance for gas and oil production is cropping up in Congress. It probably still isn't strong enough to get anywhere this year.

A wide range of proposals have been made. In the Senate, Sens. John J. Williams (D.-Del.), George Aiken (R.-Vt.), Margaret Chase Smith (R.-Me.), and William A. Purtell (R.-Conn.), are pushing a measure to reduce the allowance, now at 27½ per cent, to 15 per cent.

A similar bill has been introduced in the House by Rep. Richard M. Simpson (R.-Pa.). Rep. Charles A. Vanick (D.-Ohio) would go farther and cut the allowance to 5 per cent.

Legislation has been introduced in the Senate by Sen. Homer Capehart (R.-Ind.) to "prevent discrimination against fiscal year taxpayers with respect to depletion allowance."

Several efforts to pare the depletion allowance were made during congressional debate on legislation extending corporate and excise tax rates at existing levels for another 15 months. These rates had to be extended by April 1, and the deadline helped kill any serious consideration of the complicated depreciation question.

During Senate debate on the tax bill, Sen. Paul H. Douglas (D.-Ill.), a consistent advocate of lower depletion allowances, sought approval of a compromise depletion schedule.

Under the Douglas proposal, the 27½ per cent allowance would have remained for producers with an annual net income from all wells of $1 million or less. For producers with a net income of between $1 million and $5 million, the rate would slip to 21 per cent, and for those over $5 million, the allowance would have been cut to 15 per cent.

Although there is little chance depletion allowance will be cut this year, the needs for a review of the allowances have been sown.

Senator Williams, during hearings on the tax rate bill, pointed out that the depletion allowances now in force were set in 1926. Corporation tax rates, he says, have more than doubled since then, "so that the oil companies are not now paying their proportionate share of government costs."

Treasury Secretary George Humphrey has repeatedly said he believes the rates are about right because exploration has been encouraged to the point where reserves and demand have remained in balance.

But the Secretary says he would be "very glad" to have the lawmakers conduct a thorough study of depletion allowances.

"If you stop looking for oil and gas in this country," he says, "we would never catch up." Adequate incentives must be provided for gas and oil exploration, he contends.

Tornado film brings honor to United and TET

United Gas Corp. and Texas Eastern Transmission Corp., both of Shreveport, were honored recently by the presentation of Public Service citations by the U. S. Weather Bureau.

According to the bureau chief, F. W. Reichelderfer, the citations were made "in grateful recognition of the great public service to the peoples of the United States" performed by the two companies in jointly sponsoring the production of the documentary film, "Tornado."

Since the first public showing of the film in February 1956 in Shreveport, the 15-minute, black-and-white film has been seen by 42 million people, according to Weather Bureau officials. In addition to showing the operations of the bureau's tornado forecast and warning service, the film shows several dramatic scenes of approaching tornadoes and the precautionary measures that can be taken to reduce loss of life and property.

W. E. Wilson, representing N. C. McGowen, president and chairman of the board of United Gas Corp., and Robert J. Fitzpatrick, representing George T. Naff, vice chairman of Texas Eastern's board, accepted the citations.

Consolidated looking for Southwest reserves

Consolidated Natural Gas Co. is undertaking development of gas reserves in the Southwest for the first time.

James Comerford, president, said that $8 million has been budgeted for exploration in the Gulf Coast region and off the Louisiana coast.

The five-year program is being undertaken jointly with Mississippi River Fuel Corp., St. Louis. Other companies will participate in the off-shore exploration.

Research lab slated by El Paso Natural

Plans to construct a research laboratory near Texas Western College, El Paso, have been announced by Paul Kayser, president of El Paso Natural Gas Co.

Construction of the $200,000 building is slated to get under way soon. The laboratory will carry on both chemical and mechanical research for the improvement of the efficiency of equipment and materials used in El Paso's system.

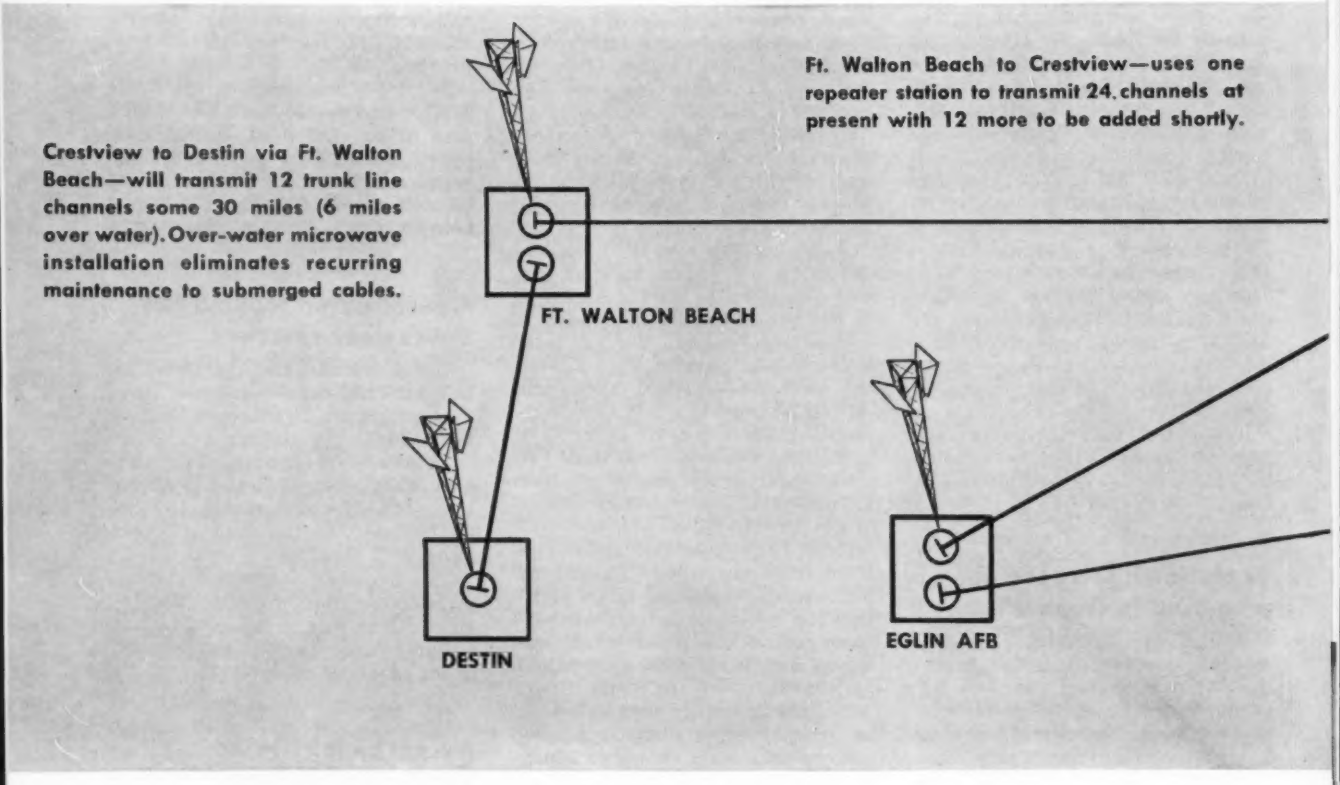
A site close to the college was chosen to take advantage of the cooperation of the college in scientific work that is carried out there from time to time.

Revised pipeline map issued by FPC

The FPC has revised its map of "Major Natural Gas Pipelines" in the United States. The new map, dated Dec. 31, 1956, supersedes the June 30, 1956 edition.

The 13 x 18-in. map is printed in five colors. Shown are major

More Philco Microwave Ordered by


Crestview to Destin via Ft. Walton Beach—will transmit 12 trunk line channels some 30 miles (6 miles over water). Over-water microwave installation eliminates recurring maintenance to submerged cables.
Ft. Walton Beach to Crestview—uses one repeater station to transmit 24 channels at present with 12 more to be added shortly.
FT. WALTON BEACH
DESTIN
EGLIN AFB

Progressive Southeastern Telephone Company Repeatedly Specifies Philco Microwave In Dynamic Expansion Program

On the basis of proven reliability, economy and efficiency, Southeastern Telephone Co. selected Philco Microwave Equipment . . . has it in operation . . . and is installing more.

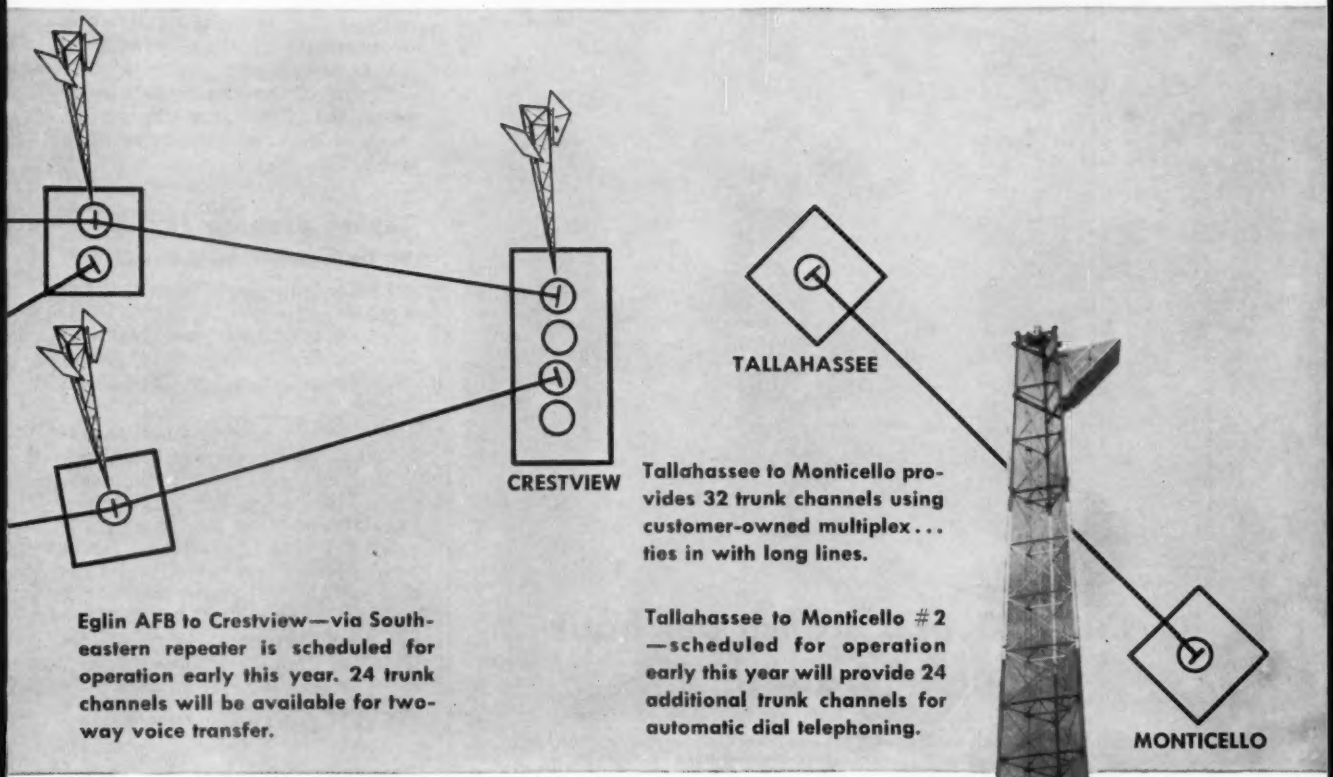
Multiple voice channeling, plus completely automatic dial system switching eliminate the need for manual switchboards at Destin and Ft. Walton Beach. Fallen transmission lines and service interruptions due to turbulent weather are a thing of the past. The need for submerged cable in the 6-mile over-water hop from Destin to Ft. Walton Beach has been eliminated entirely.

PHILCO® CORPORATION

GOVERNMENT AND INDUSTRIAL DIVISION

Philadelphia 44, Pennsylvania • In Canada: Philco Corporation of Canada Limited, Don Mills, Ontario

Southeastern Telephone Company!



Eglin AFB to Crestview—via Southeastern repeater is scheduled for operation early this year. 24 trunk channels will be available for two-way voice transfer.

Tallahassee to Monticello provides 32 trunk channels using customer-owned multiplex... ties in with long lines.

Tallahassee to Monticello #2 —scheduled for operation early this year will provide 24 additional trunk channels for automatic dial telephoning.

Linking its central toll center at Crestview to *Ft. Walton Beach, Eglin AFB* and *Destin* with low cost, automatic dial telephone service, Southeastern Tel. operates a network of Philco multiple-channel microwave trunk line carriers. Multiple trunkline switching at Destin and Ft. Walton Beach centrals is completely automatic.

Pipeline contractor praises BANTAM'S speed, versatility

Cuts 135′ of 5′ trench per hour through hard soapstone

On this pipeline job in North Carolina, ditching machines couldn't cut through the hard soapstone. But this BANTAM T-35 completed 1350′ of 5′ trench in just ten hours using a chopping action with the back hoe.

Two BANTAMS handled all rock work, river crossings, dug bell holes and cleaned out cave-ins with clamshell, and levelled up with dragline attachment.

With crane boom, this same BANTAM unloads eight carloads per day of 40′ x 10″ pipe joints weighing 1600 lb. each—loads them into trucks for stringing.

You couldn't ask more proof of ruggedness and versatility. W. L. Judd, Manager of the Pipeline Div., for J. A. Jones Construction Co., says, "The BANTAM is fast, compact and easy to operate. We like the mobility, too, because on gas transmission lines we have to jump from place to place many times a day."

Get all the facts about BANTAMS in pipeline work. Use the handy coupon.

World's largest producer of truck cranes and excavators

SCHIELD Bantam Co.

268 Park Street, Waverly, Iowa

Please send information on BANTAM Models for pipeline work as checked: P-142

☐ Carrier mounted ☐ Crawler ☐ Self-Propelled

Name_____ Title_____

Company_____

Address_____

City_____ State_____

pipeline news • *Cont'd.*

existing pipelines, those under construction, those which have been authorized and not yet started, and proposed lines which are pending FPC action. Existing or proposed pipeline systems of 120 companies are represented.

Copies of the map are available from the FPC, Washington 25, D. C., at 25 cents each. Order number is FPC M-48.

Texans propose tax on dedicated reserves

Last-minute legislation levying a multi-million dollar tax on dedicated natural gas reserves was introduced in the Texas House of representatives by Rep. Tom Joseph.

The money-raising measure followed recommendations laid down in Gov. Price Daniel's budget message. He suggested legislators consider enacting the tax on dedicated reserves if additional funds were needed. Governor Daniel estimated the proposed tax would yield "in excess of $35 million" for the next biennium. It would be levied at the rate of three-fourths of 1 per cent per Mcf on dedicated gas reserves.

TGT's assets pass $1 billion mark

Tennessee Gas Transmission Co., Houston, has joined the small list of U. S. corporations with more than $1 billion in assets after only 12 years of operation.

The $106 million expansion in 1956 of the company's system was the chief factor in increasing consolidated assets at year-end to $1,006,562,455. Further diversification and growth in the related field of gas and oil production, and in conversion and marketing of gas and petroleum hydrocarbons, added to the total.

Oil and gas exploration and production programs were materially stepped up in 1956. Above-average results were obtained from TGT's wildcat drilling program.

TGT's subsidiaries continued expansion in 1956. Bay Petroleum modernization and enlargement of its oil refineries at New Orleans and Denver and expanded its marketing facilities. Tennessee Life Insurance Co. realized substantial gains, and increased its insurance

in force by 45 per cent to $76,218,000. Petro-Tex Chemical Corp., in which TGT holds a half interest, is nearing completion of new facilities at its Houston butadiene plant which will increase production by about 50 per cent.

Two wholly owned subsidiaries began operations in '56. One was Tennessee - Venezuela S.A., which, with the subsidiaries of four other U. S. corporations, will develop oil and gas concessions in Venezuela. The other, Tennessee Products Pipe Line Co., transports, separates, stores, and markets natural gas hydrocarbons through facilities located principally in the Houston area.

American proposes demand-commodity tariff

Through a proposed change in tariffs, American Louisiana plans to use a demand-commodity form of rate instead of the cost-of-service type previously prescribed by the FPC.

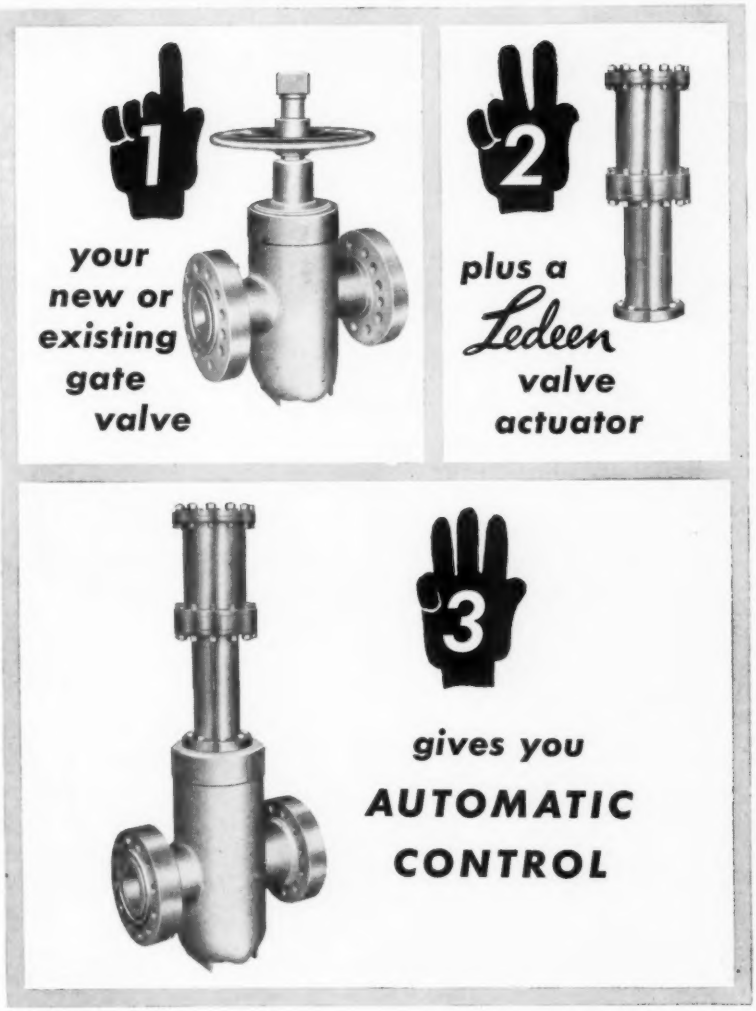
Affected by the change: Two affiliates, Michigan-Wisconsin Pipe Line Co. and Michigan Consolidated Gas Co. The resulting increase would approximate $472,000, or 1.1 per cent, based on American Louisiana sales for a 12-month period ending Aug. 31, 1957.

In its new filing, American Louisiana said that there has been a complete change of circumstances since FPC ordered the cost-of-service form. It also claims that the present form of rate is contrary to the best interests of the public because it complicates the fixing of rates for its customers. American Louisiana also said that the present rate form "destroys any incentive for efficient operation and places American Louisiana at a disadvantage with the more than 100 other pipelines which have a conventional form of rate."

Sixty per cent completion '57 goal of Trans-Canada

Almost 60 per cent of the 2294-mile Trans-Canada pipeline will be complete this year, with Winnipeg getting its gas delivery in September of this year.

In addition, this year will see the 85-mile stretch between Winnipeg and the Manitoba-Ontario border crossed by 30-in. pipe. From that point, Trans-Canada

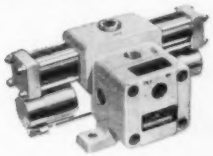


SIMPLE AS 1 2 3

Without interruption of service, and with only slight modification, every rising stem gate valve in your line can be converted to automatic control by the simple and easy process of installing Ledeen Valve Actuators.

Pneumatically or hydraulically operated, these valve actuators are adaptable to gate, diaphragm and plug valves for direct or remote control.

Ledeen Valve Actuators are available in a wide range of stem pull capacities.



Control your Ledeen Actuators with Ledeen Valves

Write for Bulletin 3030

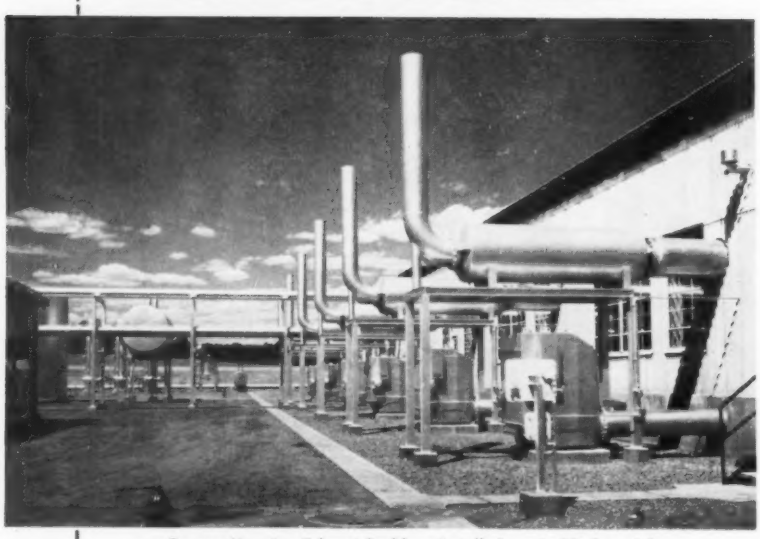
VALVES • CYLINDERS
VALVE ACTUATORS
AIR-HYDRAULIC PUMPS
AND BOOSTERS

Ledeen Mfg. Co.
3334 North Gilman Road
El Monte, California

Silencing with
New Type, Low Pressure Drop

BURGESS-MANNING Exhaust Snubbers

—used thru-out Pacific Northwest Pipe Line



Burgess-Manning Exhaust Snubbers installed on six Clark model TLA gas engine compressors at the Durango, Colorado station.

It is fitting that the latest in gas engine development—the new turbo-supercharged type engine employed by the Pacific Northwest Pipe Line—should be silenced by these equally modern and efficient B/M Exhaust Snubbers. Each of the engines is equipped with the newest design of straight thru, low pressure drop Burgess-Manning Snubbers specifically developed for this service. This B/M exclusive has resulted from an extensive and continuous research and field development program carried on by Burgess-Manning Engineers to fully satisfy the ever changing needs of industry for quieting intake and exhaust noises. Burgess-Manning's years of research and experience in the science and effect of noise and pulsation in pipe systems will effectively correct your problems and simultaneously improve your equipment performance and increase equipment life.

Eliminate "your" problems of Noise and Pulsation in Exhaust and Intake Systems and in Pressure Piping.

Consult Burgess-Manning

BURGESS-MANNING COMPANY

Sound Engineering

717 East Park Avenue, Libertyville, Illinois
Dallas, Texas

pipeline news • *Cont'd.*

will supervise construction by the Crown Corp. of another 310 miles of 30-in. to Port Arthur, making the gas available there by the fall. As part of the 1957 construction program, Trans-Canada will also build 308 miles of 20-incher from a point north of Toronto to Ste. Anne de Bellevue, at the western end of the island of Montreal.

Canadian Trade Minister Howe reports that Trans-Canada has repaid its $49,750,000 government loan along with interest and other costs. Total repayment amounted to $50,716,603.03.

Trans-Canada has also announced that it has completed financing of its share of the cost of the system. Arrangements have been made for the private placement of $104 million of the company's first mortgage pipeline bonds and for a bank loan of $20 million. Prior to this, $75 million of Trans-Canada debentures and 3,750,000 shares of common stock were sold publicly.

Court review sought on FPC rulings

Several companies are seeking court reviews on various orders issued by the Federal Power Commission.

Texas Gas Corp., Houston, has petitioned the court of appeals for the District of Columbia for review of FPC's order of Nov. 23, 1956 suspending an increase under a periodic escalation clause of the contract for sale of gas to Texas Eastern Transmission Corp.

Sun Oil Co., Dallas, has petitioned the court of appeals for the fifth circuit for review of an order rescinding and vacating certificating orders previously entered and rejecting applications for certificates because Sun is a non-signatory party.

Saturn Oil & Gas Co. Inc., Cheyenne, Wyo., is seeking a review of an FPC order holding Saturn to be a "natural gas company" by reason of its wellhead sales.

Northern files for $65 million expansion

Northern Natural Gas Co., Omaha, has filed an application with the FPC (Docket G-12241) for a $65.6 million expansion program.

Under the terms of the applica-

Cut maintenance costs. . . increase pipe life

with proven performance . . .

On job after job, pipe line men rely on these Johns-Manville Asbestos Pipe Protection Materials to fight pipe line corrosion:

Transhield Asbestos Felt—This low-cost pipe line protecting wrapper is specially designed to increase pipe life under average soil conditions. It is reinforced with continuous glass yarns, parallel spaced on ¼″ centers to give tear-free application strength. Made of coal-tar saturated asbestos, it acts as a lasting barrier to shield pipe line enamels from earth loads and soil stresses.

#15 Asbestos Pipe Line Felt—A heavy-duty material particularly suitable for severe soil conditions or where a heavier material than J-M Transhield is desired. Provides long life, toughness, flexibility, resistance to rot, decay, cracking, and impact. J-M #15 Asbestos Felt now protects more than 100,000 miles of oil and gas pipe lines. Widths 2″ to 36″. Rolls any length desired.

For further information about Johns-Manville Products for Pipe Line Protection, write to Johns-Manville, Box 14, New York 16, N. Y.; in Canada, Port Credit, Ontario

JOHNS-MANVILLE JM PRODUCTS **Johns-Manville** **PRODUCTS FOR PIPE LINE PROTECTION**

Recent aerial photograph of Standard Pipeprotection plant, showing increased facilities.

Each successive year more pipe passes through the St. Louis Gateway, where at Standard Pipeprotection it is coated and wrapped according to procedures that establish the highest standards of quality for pipe protection.

This increased traffic has necessitated the erection of extra pipe storage areas with greater capacity, additional railway sidings, new coating and wrapping machines, much larger parking areas, more roads for truck deliveries and enlarged office space.

The benefits you receive from SPI coated and wrapped pipe have resulted in more business for us.

standard pipeprotection inc.
3000 SOUTH BRENTWOOD BLVD. • ST. LOUIS 17, MISSOURI

tion, Northern Natural wants to supply additional contract demands from present customers for the 1957-58 heating season and to provide service to 213 additional communities in Minnesota, Iowa, Nebraska, South Dakota, and Wisconsin. These communities are not now receiving natural gas service.

Twenty-seven of the 213 communities are included in the service proposed in Northern's long-pending Docket G-2399, et al. The 27 would include service to the Duluth-Superior area and to Iron Ranges Natural Gas Co. for service to 19 Mesabi Range towns and two northeastern Minnesota communities.

In its new application, Northern proposes to increases its system capacity by 149 MMcf/day, of which 47 MMcf would go to presently connected communities. The increase would make Northern's total salable capacity 1345 MMcf/day.

Am-La trims 40 MMcf from 100 MMcf program

American Louisiana Pipe Line Co. has scaled down, at least for the time being, its plan to expand the capacity of its Louisiana-to-Detroit system.

Originally, the company planned to boost its capacity by 100 MMcf/day, to a total of 400 MMcf. Testimony before the FPC examiner, however, shows the company plans only a 60-MMcf daily increase at this time.

A company spokesman said the company has enough gas for the 60-MMcf hike, but not enough for a 100-MMcf boost. But he contended the company doesn't need the remaining 40 MMcf right now.

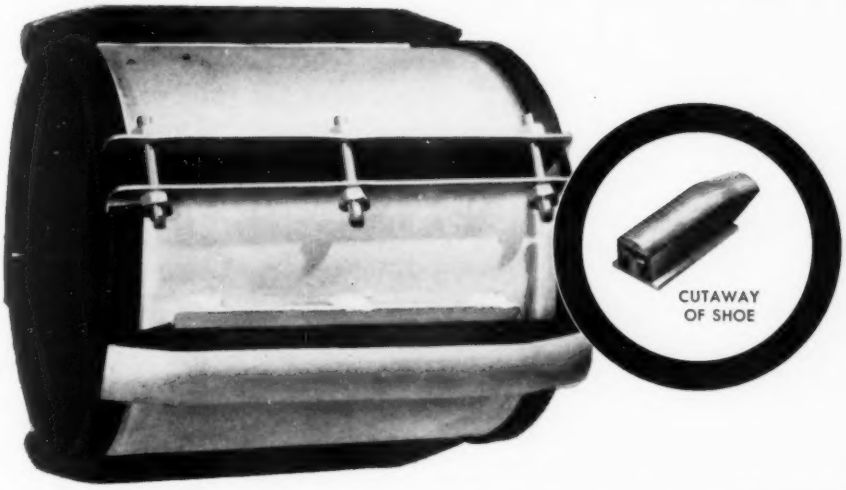
American Louisiana hasn't formally amended its FPC application for the larger amount, but is only submitting evidence to back up the 60 per cent of this amount.

FPC speeds decision on TET conversion

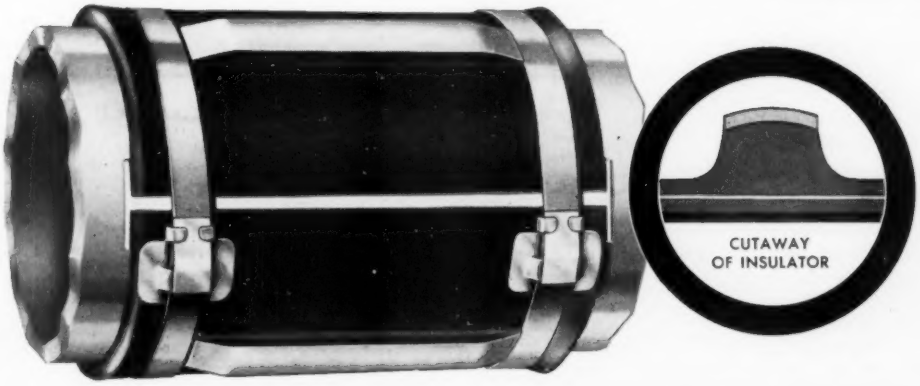
The intermediate decision procedure is being omitted in the case involving the conversion of Texas Eastern Transmission Corp.'s Little Inch from natural gas to petroleum products.

In ordering the omission, the FPC pointed out that failure to do

Model 55 Maloney Insulators for LARGE JOBS



Model 56 Maloney Insulators for Small Jobs



Maloney Insulators for *Every Job!*

Maloney Crossing Insulators for pipeline casing are exceptionally rugged, easy-to-install . . . *and adaptable to a wide range of pipe sizes and differentials.*

Because they are bonded metal-to-neoprene-to-metal, Maloney Insulators provide good shock-absorption, plus flexibility to compensate for pipe shifting.

Streamlined "sled-type" steel runners make for easy entry into the casing, and prevent hanging-up on casing welds as pipe is being run.

Model 55 Maloney Crossing Insulators, in all sizes through 36", are fitted with an extra-wide steel band for positive grip. Model 56, for pipe sizes through 12" with 2" nominal pipe size differential, are fastened to the carrier pipe with stainless steel bands. Both types offer greater dependability—greater protection against corrosion with high dielectric strength neoprene, and against physical damage with steel runners—than any other insulator on the market. Maloney Crossing Insulators are in use on most of the country's major pipelines.

"Something from the Irishman"

F. H. MALONEY
Company

2301 TEXAS AVE. • FA 3-3161 • HOUSTON

SINCE 1932 — PRECISION IN RUBBER — METAL — PLASTICS

so would result in additional delay of a decision in the proceedings which have been pending for more than two and a half years. Such a delay, the commission said, would postpone potential savings at the rate of $4 million annually if the abandonment should be finally authorized. In addition, it would foreclose savings in construction costs which might accrue through use of the same construction crews and contractors for this project as are being used on other current work.

Meanwhile, an investment banking group is offering $40 million of Texas Eastern first mortgage pipeline bonds, The 4⅞ per cent series due in 1977 is priced at 99½ per cent to yield approximately 4.9 per cent to maturity.

Proceeds from the sale will be used by Texas Eastern in connection with its $238 million construction program. The plan covers an increase of 250 MMcf/day in the system's capacity and the reconversion of the Little Big Inch pipeline.

Construction underway for new compressor station

Preliminary earth work is under way at the site of Southern California and Southern Counties Gas companies' new compressor station near Needles, Calif.

Actual construction work is scheduled to begin May 1 on the multi-million dollar plant, which will push out-of-state gas through the new 30-in. line now being constructed between Needles and Newhall. Part of a vast $33.5 million transmission system, the new compressor plant is designed to handle the daily load of 278.2 MMcf of gas that will be transported into southern California when the project is completed later this year.

According to SoCal's president and general manager, F. M. Banks, the plant will initially house four of five 2000-hp, turbo-charged Clark compressors. Eventually, the plant is expected to contain 10 compressors.

Construction of approximately 244 miles of line between Needles and Newhall—the major portion of the overall project—is more than one-fourth finished. Actual work has progressed some 70 miles west from the California border. Overall, the new line, including an already-completed 49-mile stretch between Alhambra and Newhall, will run approximately 285 miles. According to current schedules, the line will be completed and in operation by June 30. The new compressor station is slated for completion later this year.

Construction will begin May 1 on SoCal and SoCounties new compressor station near Needles, Calif. Preliminary plans call for four or five 2000-hp compressors. Eventually, the plant will house 10 compressors.

Cities Service plans system expansion

Cities Service Gas Co. is planning a construction program, estimated to cost $11.3 million, in Kansas and Oklahoma (Docket G-10956).

Included in the plans: a 3600-hp addition to the Blackwell compressor station in Kay county, Okla. and 115 miles of various diameter pipe in Montgomery, Allen, Anderson, Franklin, Miami, Johnson and Wilson counties, Kan.

An underground storage field in Wilson and Neosho counties, Kan. will be acquired, developed and operated. Dehydration facilities for 100 MMcf/day of gas will be built and 23.5 miles of field pipeline installed.

Cities Service proposes to reclaim 194.4 miles of line in several Kansas counties and to abandon service to Gas Service Co. for resale to 72 individual domestic tap customers. These customers are located on the facilities Cities Service proposes to reclaim between its Grabham and Glavin stations.

Natural lets contracts for new construction

Contracts have been let by Natural Gas Pipeline Co. of America for laying a 20-in. line across the Red river and for the survey and construction of 25 erosion dams.

Work has already begun on these portions of Natural's 259-mile line to transport gas from Wise and Jack counties into the Chicago market area. Completion is slated for next January.

Natural's president, J. J. Hedrick, has announced that Natural has signed a contract to purchase from Lone Star Gas Co. increasing quantities of gas, totaling 80 MMcf/day by 1960.

110 MMcf/d expansion planned by Texas Eastern

Texas Eastern Transmission Corp., Shreveport, and its wholly owned subsidiary, Texas Eastern Penn-Jersey Transmission Corp., will add approximately 110 MMcf/day to the capacity of Texas Eastern's transmission system.

Total cost of the project is estimated at $30.3 million. The parent company will spend $25.9 million while Penn-Jersey's share is $4.4 million.

A total of 67,610 hp in compression will be added to existing facilities and 137 miles of line will be built.

One new compressor station (10,250 hp) is planned for Mont Belview, Texas. This is on Texas Eastern's recently authorized 30-in. line from Beaumont to McAllen, Texas. Horsepower additions on the existing 30-in. line between Beaumont and Kosciusko, Miss. consist of: 5200 hp at Gillis in Beauregard parish, La.; 5280 hp at Opelousas in St. Landry parish, La.; 5200 hp at St. Francisville in West Feliciana parish, La.; 5280

Why DARLING-McEVOY 2-way conduit gate valves

JUST CAN'T LEAK!

IT'S simple. Regardless of flow direction, a sealant *automatically* completes a pressure-tight seal between the downstream seat and gate. This is the inevitable result of pressure differential at the time of closure.

Similarly there can be no behind-the-seat leakage! For, as shown here, each seat is *double-grooved* to seal against the valve body as well as the gate.

It is this unique feature, with its positive, automatic self-sealing, that establishes the Darling-McEvoy conduit gate valve as the world's tightest!

Isn't it likely that you could benefit by such valve performance as time goes on? Get the *whole* story . . . get details on this and the other unusual features that make these field-proved valves truly outstanding for low-cost, trouble-free operation. Just ask for Bulletin 5402.

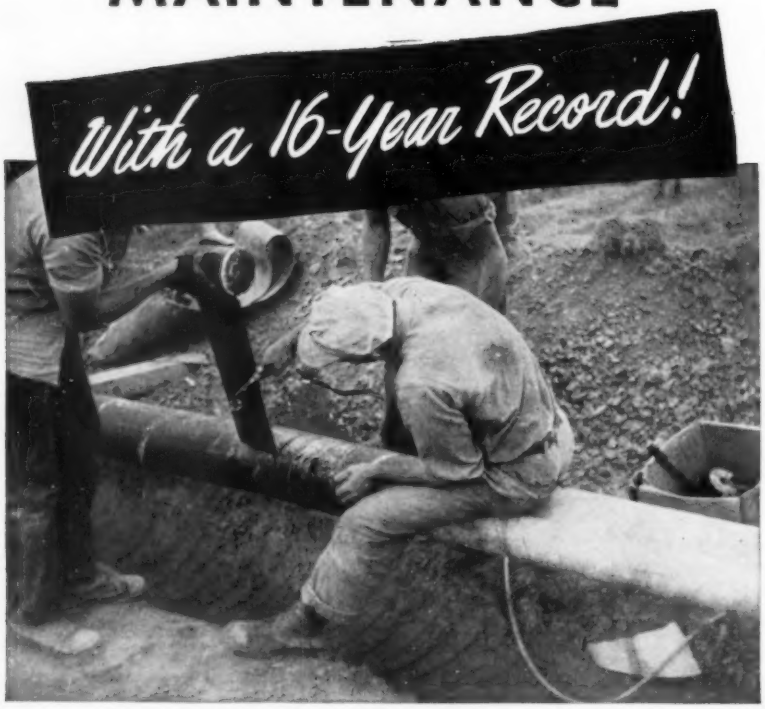
Section view of Darling-McEvoy 2-way conduit gate valve, showing twin sealant reservoirs, double-gate parallel seat design, and sealing grooves. Sizes: 8 inch and larger.

DARLING
TRADE DARLING MARK
VALVES

DARLING VALVE & MANUFACTURING CO.
Williamsport 26, Pa.

Manufactured in Canada by Sandilands Valve Manufacturing Co., Ltd., Galt 19, Ont.

PREVENTIVE MAINTENANCE



GIVE PIPE, PIPE JOINTS, FITTINGS and COUPLINGS THE *QUALITY PROTECTION* BUILT INTO

Time-Tested **TAPECOAT®**

To reduce maintenance costs on distribution lines, you need the best possible protection you can get at lowest possible cost. Since 1941, TAPECOAT has led the way in providing dependable, low-cost preventive maintenance on gas lines in underground service.

Today, the performance of this original coal tar coating in handy tape form is more important than ever in your maintenance picture. Equal in effectiveness to mill coating on the pipe, TAPECOAT gives your lines the continuing protection of coal tar. It can be applied *positively* because it has its own perfect bond. No skilled help is required because it is simple to spiral-wrap with the use of a torch. And once TAPECOAT is on, you know from its 16-year record that it will give you uninterrupted protection.

TAPECOAT comes in rolls of 2″, 3″, 4″, 6″, 18″ and 24″ widths. Also available in asphalt. Find out today how it can fit into your preventive maintenance program and help you save time, labor, material and money.

Write for brochure and prices

The TAPECOAT *Company*

Originators of Coal Tar Coating in Tape Form

1535 Lyons Street, Evanston, Illinois
Phone DAvis 8-5220

pipeline news • *Cont'd.*

hp at Union Church, Jefferson county, Miss.; 5200 hp at Clinton, Hinds county, Miss.; and 5000 hp at Kosciusko. A 2000-hp addition to a previously authorized station near Linden, N. J. is also requested.

In addition, metering and regulating stations will be needed to make the sales of the larger amount of natural gas to be moved through the line.

Pipeline construction consists of approximately 16 miles of 30-in. loops between Kosciusko, Miss. and Uniontown, Pa., and 40 miles of new lateral supply lines.

When authorized, Penn Jersey will construct and lease to its parent the following additions to existing or authorized compressor stations in Pennsylvania: 4000 hp at Delmont, 5000 hp at Lilly, 5000 hp at Perulack, 5000 hp at Grantville, and 5000 hp at Bechtelsville.

Target date for completion of the project is Sept. 1, 1957. This date coincides with the completion date of an already authorized project which will increase Texas Eastern's system by 250 MMcf/day.

Saskatchewan moves for more control of pipelines

The Saskatchewan government has made a move to exercise more control over pipeline tariffs.

The amendment to the pipeline bill, which has passed second reading, requires pipeline operators to furnish information on capital, traffic, revenues, expenses and other details of corporate structure and operations. It also provides for board hearings at the request of the government or an interested party and the furnishing of information required.

New company will render data processing service

A newly organized company is offering services in electronic computing and data processing on a contract basis. Known as the Datics Corp., the company headquarters in Fort Worth, Texas.

The company is headed by Kenneth L. Austin as president.

Services offered by the company include the following: (1) large-scale scientific computing; (2) contract data processing for industrial and commercial concerns;

Proven Leaders In The Pipe Line Construction Field

Installation of Pipe on Pedestals for Reservoir Crossing

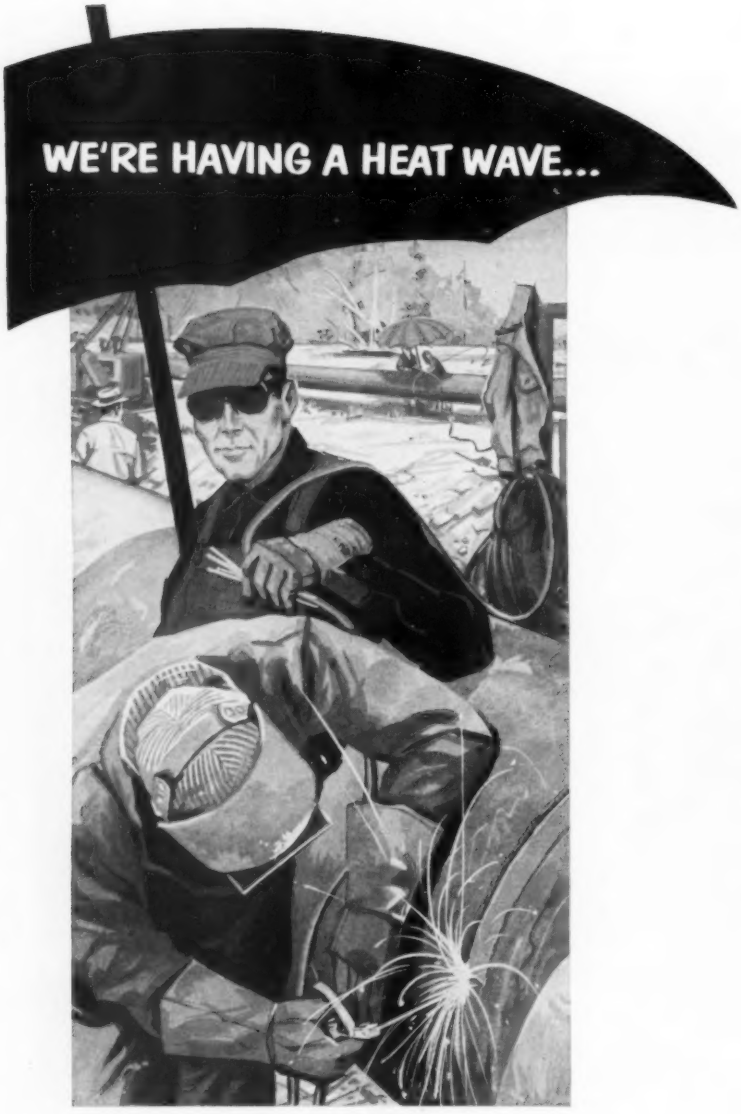
THE HALLEN CONSTRUCTION CO., INC.

4270 AUSTIN BLVD.
ISLAND PARK, NEW YORK

HALCOWELD

11 WEST 42nd STREET
NEW YORK, N. Y.

139 PARAMOUNT STREET
SPRINGFIELD, MASS.



...but neither summer sun nor winter snow stops Transco's search for new and profitable markets for natural gas. During 1956, Transco delivered record quantities of gas to heat-hungry markets. This year, look to Transco for a real heat wave... a wave to increase natural gas movement—to bring heat for warmth and fuel for power to our best potential markets... the places where the most people are.

HELPING TO EXPAND THE MARKETS
FOR TEXAS-LOUISIANA NATURAL GAS

TRANSCONTINENTAL GAS PIPE LINE CORPORATION

pipeline news • *Cont'd.*

(3) contract data reduction for scientific and engineering needs; (4) consultation to determine equipment needs for firms considering installation of their own computing systems; (5) personnel training, problem analysis, and computer programming and coding for companies now operating their own computing systems; (6) assistance to clients in the solution of a broad range of technical problems relating to computing; (7) design of advanced or specialized equipment for use in computing, data reduction, and data processing.

Fair field price valid, says Arkansas official

Arkansas' new fair field price plan for setting gas rates is constitutional and valid, the state's attorney general has ruled.

The new law allows Arkansas Louisiana Gas Co. to exclude its own production properties from its rate base. The company produces 20 per cent of its own gas.

This opinion resulted from the request of Rep. Hardy W. Croxton, who had opposed Ark La's use of the plan in rate cases before the public service commission.

The bill making the fair field price method legal was passed by an 83 to 9 majority before it was signed by the governor. The bill itself resulted from an earlier Arkansas supreme court verdict which rejected a 1955 PSC decision concerning Ark La's rates. At that time, the PSC had said the company could base its charges to industrial customers on the fair field price theory. The court found the theory "unlawful" and directed the commission to reinstate an overall return of 6.34 per cent instead of the 8 per cent allowed on industrial gas sales.

Government dissolves gas advisory council

After three years of inactivity, the Gas Industry Advisory Council has been dissolved by Secretary of the Interior Fred A. Seaton.

The council was established six years ago under provisions of the Defense Production Act. Its function was to give advice and counsel in connection with defense mobilization responsibilities for

Construction men fought terrain and bitter cold in the construction of PNW's "scenic-inch" pipeline.

Why communications have to be good on Pacific Northwest's "scenic-inch" line

Pumping gas over mountain passes across 1487 miles of America's toughest terrain requires the most reliable communications available.

Pacific Northwest Pipeline Corp. presented this requirement to the Bell System, with one additional request—economy.

The result is a private line telephone system that PNW's Salt Lake City control center uses to keep a running summary of conditions along the line. Information gathered in Salt Lake City from each compressor station includes dew point, BTU content and specific gravity of the gas. Dispatchers use this data as guidance in controlling flow.

• • •

Bell System communications can work for you as fast and reliably. Just call your Bell Telephone Company business office. A representative will gladly discuss your requirements.

Pacific Northwest's Salt Lake City dispatchers collect data hourly from every compressor station and maintenance point on the company's 1487-mile pipeline.

BELL TELEPHONE SYSTEM

PRIVATE LINE TELEPHONE • PRIVATE LINE TELETYPEWRITER DATA TRANSMISSION SYSTEMS • CHANNELS FOR: REMOTE METERING AND CONTROL • TELEPHOTOGRAPH • CLOSED CIRCUIT TV

gas which had been delegated to the secretary of the interior.

During the last three years, Secretary Seaton has not had occasion to convene or use the services of the council.

Regina, Sask., to have gas system by September

Arrangements have been completed for a new gas distribution system in Regina, Saskatchewan. Work is expected to begin early in May with completion slated for September.

Contracts were let by Saskatchewan Power Corp. to Pacific Pipeline Construction Co. and S. E. Pipeline Construction Co., who will do the work as a joint venture.

Some 300 miles of pipe are involved in the construction program. This includes 150 miles of 2- to 18-in. mains and 150 miles of small diameter service pipe. A total of 10,000 services will be installed. Fifty miles of the pipe will be from the new steel pipe plant in Regina and the rest is from Page Hersey in Toronto.

Texas, Louisiana job okayed for Transco

The FPC has authorized (Docket G-10626) Transcontinental Gas Pipeline Corp., Houston, to construct and operate facilities in Texas and Louisiana at an estimated cost of $4.7 million.

Under the certificate, Transco will build an 880-hp booster station at Mission Valley in Victoria county, Texas; an 880-hp booster station and dehydration station in Luby field, Nueces county, Texas; and an 880-hp booster station, dehydration station, and purchase meter in Greta field, Refugio county, Texas.

The authorization also includes installation of an additional 3550-hp unit in Harris county, Texas; a 5000-hp addition in Beauregard parish, La.; 3.4 miles of 10-in. laterals in the Greta field; and the construction of a 2200-hp compressor station in Nueces county, Texas.

Transco stated in its application that to prevent and offset drainage, it has been drawing nearly 100 MMcf/day from Greta by using the 3.4-mile transmission lateral. Lack of sufficient compressor facilities forced this move. In order to get that much gas into its mainline and transport it out of Texas, Transco had to cut back takes for all Texas sources south of Greta and one major source north of Greta field.

In August 1956, the FPC temporarily authorized the construction and operation of the lateral line and in January of this year temporarily authorized the construction and operation of the remaining facilities except the 2200-hp station in Nueces county. No temporary authorization was requested on this compressor station. The additional facilities, Transco said, will restore essential flexibility to its system by providing an additional 35 MMcf in the Texas supply system.

Integrity

HAS BUILT OUR REPUTATION

FOR

BUILDING

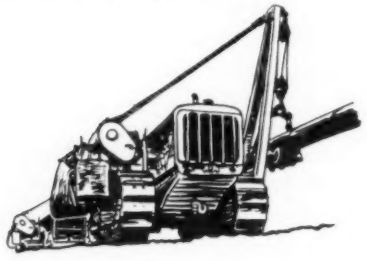
BETTER

PIPE LINES

Houston
CONTRACTING COMPANY
GENERAL CONTRACTORS
Laurence H. Favrot • R. P. Gregory • Geo. A. Peterkin

OIL • GAS
GASOLINE
WATER PIPE LINES

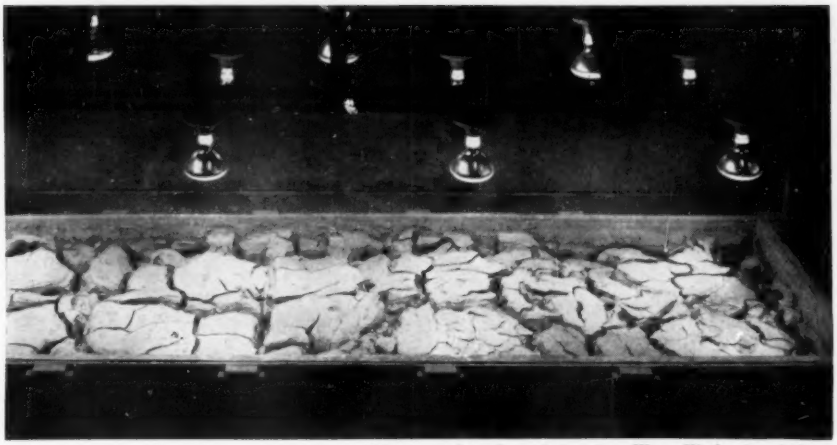
2707 FERNDALE
HOUSTON 6, TEXAS



What happens to pipe wrap underground?

Here's what a federal agency found out*. . .

Many wrap and enamel combinations were imbedded in a test tank filled with bentonite clay slurry. Extreme soil stresses were imposed on these samples by alternate wetting and drying cycles. Resistance to backfill puncture was also checked after each cycle. Holiday-detection tests showed that the glass fiber and coal-tar combination stood up through the full 25 cycles of the test.



**As reported in Journal American Water Works Association, Vol. 48, Feb., 1956. Photo courtesy U.S. Bureau Of Reclamation.*

These impartial tests show why BLUE FLAG gives you complete pipeline protection

It was conclusively demonstrated that glass fiber mat like Blue Flag, with coal-tar enamel, provides effective protection against *both* soil-stress and backfill-puncture action. (See picture caption above for actual test conditions.)

This is the kind of protection you need for maximum service life. Yet it's yours for only ½ of 1% of initial pipeline cost when you use L·O·F Glass Fibers' Blue Flag.

No wonder glass fiber reinforcement like Blue Flag Pipe Wrap is preferred. It strengthens enamel . . . assures coating essentially free of holidays. And, Blue Flag helps speed application—its high tensile strength virtually eliminates breakage in the wrapping operation.

Yard-wrapped, or applied over-the-ditch, Blue Flag can be the answer to your pipeline protection problems. It's available from conveniently located distributor warehouses. For the address of the one nearest you, or for technical information, write: *L·O·F Glass Fibers Company, Dept. 74-57, 1810 Madison Avenue, Toledo 1, Ohio.*

L·O·F GLASS FIBERS

L·O·F GLASS FIBERS COMPANY • TOLEDO 1, OHIO

GAS pipeline notes

El Paso (Texas) Natural Gas Products Co. plans a new 6500-bbl/day combination crude oil refinery and alkylation plant on the southeastern outskirts of Odessa, Texas. A 6-in. products line will extend from the refinery to the El Paso area.

Texas Illinois Natural Gas Pipeline Co., Chicago, has FPC okay for new gas facilities estimated to cost $1.7 million. Included in the project is approximately 9.5 miles of 36-in. line looping an existing 30-in. line. The looping will run from a point on the north bank of the Illinois river to Texas Illinois' Joliet regulator station serving the Chicago area.

About 10.5 *miles* of 8⅝-in. line will be installed by Southern Natural Gas Co., Birmingham, under terms of a recent FPC certificate (Docket G-11234). Included in the $1.5 million project are two measuring stations; two 660-hp compressor units at Toca station; one 550-hp unit at White Castle; and one 1350-hp unit at Gwinville. Additional gas reserves from the Napoleonville and Fort Jackson fields will become available through the new facilities.

All of the Kansas producing properties, undeveloped leases and non-producing royalities and minerals owned by Midstates Oil Corp. have been acquired by Tennessee Gas Transmission Co., Houston. The properties in 38 central and western Kansas counties include 54 oil wells on 2280 producing acres and about 83,000 acres of undeveloped leases.

Leonard E. Eesley, a member of the FPC's legal staff since 1938, has been named assistant general counsel. He succeeds John C. Mason, who is now deputy general counsel. FPC has also appointed Dale E. Goubleman, a staff public utility specialist and rate-of-return witness, to the newly created post of deputy chief, bureau of rates and gas certificates.

The FPC has authorized United Gas Pipe Line Co., Shreveport, to construct facilities to serve Container Corp. of America's Brewton, Ala. pulp and paper mill. Container Corp. will reimburse the $1,140,419 United spends on the facilities. During each of the first three full years, United estimates it will deliver 1750 MMcf to Container. Peak-day requirement is estimated at 6 MMcf. Forty miles of 8-in. line plus metering and regulating facilities will be built.

Tennessee Gas Transmission Co. plans a natural gas processing plant near Lovington, N. M. to serve the West Eidson area of Lea county, N. M. Designed as an absorption-type plant, it will have an initial capacity of 10 MMcf/day of gas. Daily production of approximately 43,000 gal. of propane, butanes, and natural gasoline is anticipated. Completion is scheduled for late 1957 or early 1958.

Transfer of the gas reserve and supply section from Shreveport to Houston has been completed by Texas Eastern Transmission Corp. According to Mills Cox, vice president in charge of gas supply, the move was made to bring the section nearer to the center of present and future sources of gas supply.

MIDWESTERN'S stable of Corrosion fighters

KAPCO ROCK SHIELD · CORONAT · GLASFAB · GLAS KOTE · K

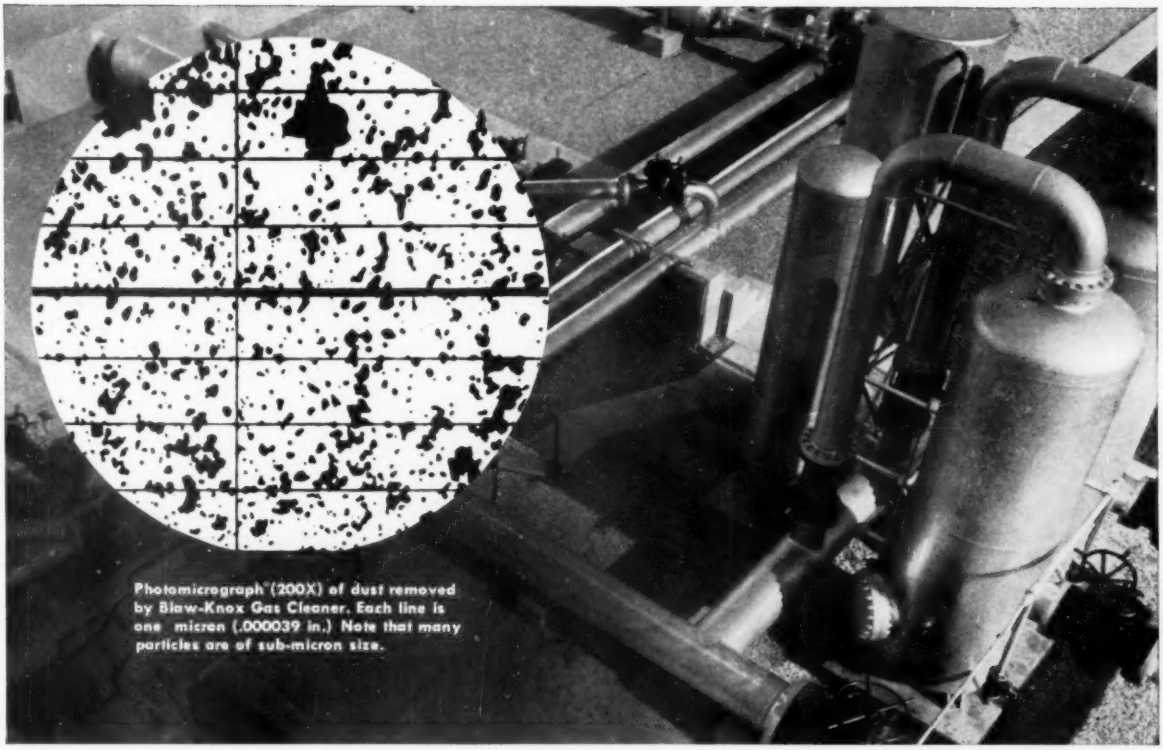
Midwestern's leadership in the field of pipeline corrosion control is the result of aggressive service practices, together with the most improved materials available . . . KAPCO Rock Shield — for pipe protection in rocky areas . . . GLASFAB Hot or Cold Dope Wrap — for emergency pipe line repairs . . . Owens-Corning Fiberglas CORO-MAT — for reinforcing enamel for lifetime protection of underground pipe . . . GLAS-KOTE handy tape for pipeline joint and fitting wrapping . . . KEYSTONE Asbestos Felt — for high impact and soil acid resistance.

There's a Midwestern representative within a few hours of your pipeline requirements . . . wherever they are.

MIDWESTERN PIPE LINE PRODUCTS COMPANY

P. O. 1886, Tulsa, Oklahoma • Hickory 6-6144

HOUSTON, TEXAS — #1 Briar Dale Ct. — Mohawk 7-2493
ATLANTA, GEORGIA — 3131 Maple Drive — Exchange 1335
MT. PROSPECT, ILL. — Box 225 — Clearbrook 3-4439
PITTSBURGH, PA. — 1125 Park Bldg. — Express 1-3952
OKLAHOMA CITY, OKLA. — 15 S. W. 29th St. — Central 2-2527
PORTLAND, ORE. — 901 N.W. 11th St. — Capitol 7-3747



Photomicrograph (200X) of dust removed by Blaw-Knox Gas Cleaner. Each line is one micron (.000039 in.) Note that many particles are of sub-micron size.

dust particles 20 microns and below travel easiest, farthest — do the most damage

Field tests prove Blaw-Knox Gas Cleaners remove even the smallest dust particles

The test of any gas cleaner's efficiency should be measured *not* in terms of the amount of dust collected, but in terms of the quantities entrained in the "clean" gas. The removal of a high percentage of large dust particles is a relatively easy task. However, it is the particle sizes of 20 microns and below that travel easiest, farthest and cause the most damage. Blaw-Knox Gas Cleaners remove even the smallest particles of these dusts.

A large number of field performance tests have been run to determine the dust removal capacity of Blaw-Knox Gas Cleaners. Inlet dust loadings ranged up to 547 pounds per million cubic feet of gas. Tests on the cleaner outlet showed absolutely no dust getting past.

The ability of Blaw-Knox Gas Cleaners to maintain such performance is due to an exclusive operating principle through which each tiny particle of dust is placed immediately in violent, intimate contact with oil. In the expansion separation stages, a major portion of dust-laden oil drops out of the gas stream. An oil-wet, multiple baffle, primary separator catches and agglomerates the remaining tiny wet particles. Finally the gas is scrubbed by an efficient, multiple vane mist extractor.

When you buy, be sure to specify Blaw-Knox, for when you place a Blaw-Knox Gas Cleaner on stream, you're sure to remove even the smallest particles of dust.

Blaw-Knox Electroil and Portable Hot Oil Foggers provide a safe, compact, efficient means of producing a stable oil fog in your gas streams.

A STABLE OIL FOG IN YOUR GAS MAINS:

Will wet down existing dust deposits.

Will prevent drying out and eventual dislodging of existing wet deposits.

Will moisten leather diaphragms.

Will curb internal corrosion of steel mains.

Will prevent loss of odorant by reaction with pipe scale.

Will help to prevent drying out of jute-joint packing.

BLAW-KNOX

BLAW-KNOX COMPANY

Buflovak Equipment Division
1547 Fillmore Avenue
Buffalo 11, N. Y.

corrosion prevention

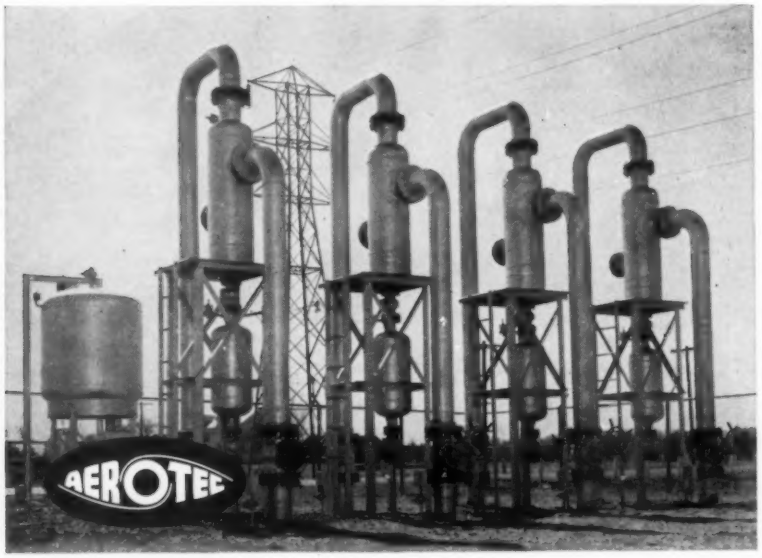
(*Continued from page* 27)

In this simple series circuit it is easy to see that if the coating itself has very low conductance, the conductivity of the soil is relatively unimportant. This is the common, but fallacious, belief referred to in the introduction.

The fact is that we never measure coating leakage conductance under such conditions. Where actual pipelines are concerned, what we do measure is the *effective* or *equivalent* conductance of a coating which has holidays in it. The materials of which our coatings are made all have much lower conductivities than the values we find in our field tests. The higher values we find in the field are not due to changes in the electrical characteristics of the coating material, but to the presence of holidays. These holidays are filled with soil moisture, and they have essentially the conductivity of the adjacent soil.

It is clear, then, that we have a parallel circuit—or a complicated series-parallel circuit. Between the pipe and the remote earth we now have two circuit elements; the first is the unimpaired coating, and the moisture-filled holidays, in parallel; the second is the soil, and, as before, it is primarily the adjacent soil.

We shall discuss later what we mean by such terms as "mean soil conductivity" and some of the implication of this idea. ■



cleaning gas without wetting agents

These four Aerotec Gas Scrubbers, operating in parallel, were installed by a large utility to clean the gas at the entrance to the Albany, New York distributing station.

Dry clean gas is a necessity at this critical point, and these units have been serving the community for several years with no liquid carry-over. They operate on the principle of centrifugally removing solid and liquid contaminants from gas, a method in use for many years in dust control.

Aerotec Dry Gas Scrubbers are serving the industry on practically every major gas line today. Their outstanding performance presents an unexcelled record and their comparatively small size simplifies installation in limited space.

Our Project Engineers have a background of experience in solving gas scrubbing problems that will be valuable to you.

Project Engineers **THE THERMIX CORPORATION** Greenwich, Conn.
(Offices in 38 principal cities)
Canadian Affiliates: T. C. CHOWN, LTD., 164 Metcalfe Ave., Westmount, Montreal 6, Que.

Manufacturers
THE AEROTEC CORPORATION
Greenwich, Conn.

GAS pipeline people

KARL E. SCHMIDT has been named chief engineer of the American Natural Gas Co. system. Mr. Schmidt, vice president and engineer of Michigan Consolidated Gas Co., Detroit, was also elected vice president and engineer of Michigan Wisconsin Pipe Line Co., American Louisiana Pipe Line Co., and American Natural Gas Service Co. Michigan Consolidated has announced the retirement of CHARLES R. HENDERSON as general manager of the Ann Arbor district. JACK D. HOGAN succeeds him.

A. L. Roberts
Texas Gas

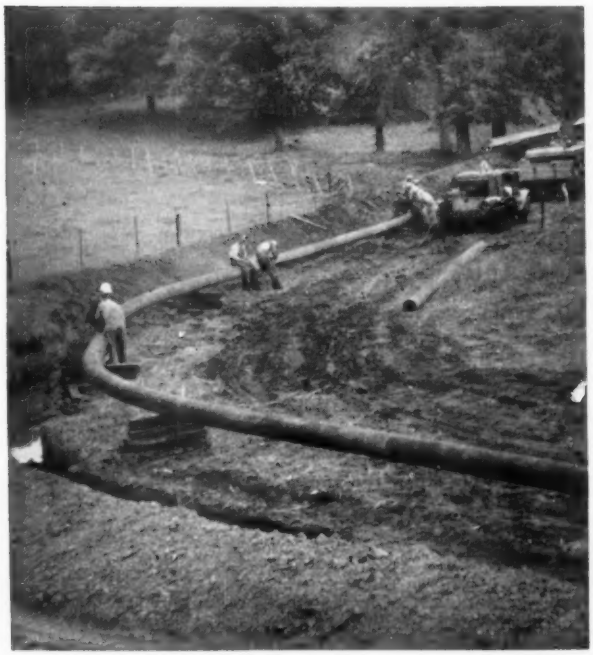
Karl Schmidt
American Natural

Responsibility for the executive direction of the operating departments of Texas Gas Transmission Corp., Owensboro, Ky., has been assigned to Vice President A. L. ROBERTS. As vice president in charge of operations, he succeeds the late L. E. Ingham. Mr. Roberts joined a TGT predecessor in 1930. In 1948, following the merger of Kentucky Natural Gas and Memphis Natural into Texas, Mr. Roberts assumed supervision of the construction of the company's new system. In 1949 he was appointed general superintendent and the board of directors elected him vice president in April 1956.

Trunkline Gas Co., Houston, has opened a production and supply field office in Corpus Christi. JOHN D. GAUNTT JR. is district geologist for the area.

Youngstown

OFFERS THE "BIG 5" IN ELECTRIC WELD LINE PIPE FOR OIL AND GAS PRODUCING AREAS. . .PROVEN AND READY FOR EFFICIENT SERVICE IN THE FIELD



Here are the "Big 5" reasons why Youngstown Electric Weld Line Pipe is your best buy:

1. It bends readily
2. Wall thickness is uniform
3. Line up characteristics are excellent
4. Weldability is outstanding
5. Long lengths save you time and trouble

Terrain dictates some mighty peculiar contours. As an oil or a gas man, you're well aware of this. But, are you also aware of the secret of bendability of line pipe? It's simply the right combination of physical and chemical properties. Youngstown Electric Weld line pipe manufactured from uniform high quality steel, is capable of producing even smooth bends to fit any contour with uniform roundness. You know the importance of this—you know what this means on any job.

Youngstown maintains sales and service offices throughout the oil and gas producing country—see your area representative soon.

Youngstown

ELECTRIC WELD LINE PIPE

QUALITY YOUNGSTOWN SERVICE

THE YOUNGSTOWN SHEET AND TUBE COMPANY *Manufacturers of Carbon, Alloy and Yoloy Steel*

General Offices: - - - Youngstown 1, Ohio.

pipeline people • *Cont'd.*

CRYMES PITTMAN has been named assistant manager of the Jackson, Miss., office of United Gas Pipe Line Co. United Gas is establishing an office at Mobile and Mr. Pittman will be located there.

JACK E. HESSE is manager of the new Johns-Manville Transite asbestos-cement pipe plant under construction in Denison, Texas. Mr. Hesse has been with Johns-Manville since 1938.

J. C. LESARD, J. W. MCKEE, and DR. C. S. WALTERS have been named directors of the Northern Ontario Pipe Line Corp., Ottawa.

ERNEST F. SEMRAD has been appointed assistant chief engineer of Michigan Wisconsin Pipe Line Co. and American Louisiana Pipe Line Co., Detroit. JAMES J. TREBLICOTT is assistant manager of operations of Michigan Wisconsin.

R. L. HARRIS has joined Northern Natural Gas Producing Co. as production engineer. He will supervise the drilling, completion and production of oil and gas wells in the company's Calgary, Alta., Canada district.

G. T. Naff
Texas Eastern

Don Shannon
Williamson

LOUIS MATTHEWS has joined the sales staff of Allan Edwards Inc., Tulsa. He will work out of the company's Kansas City office. WILLIAM ERWIN is a new sales engineer with Allan Edwards Manufacturing Co., Tulsa.

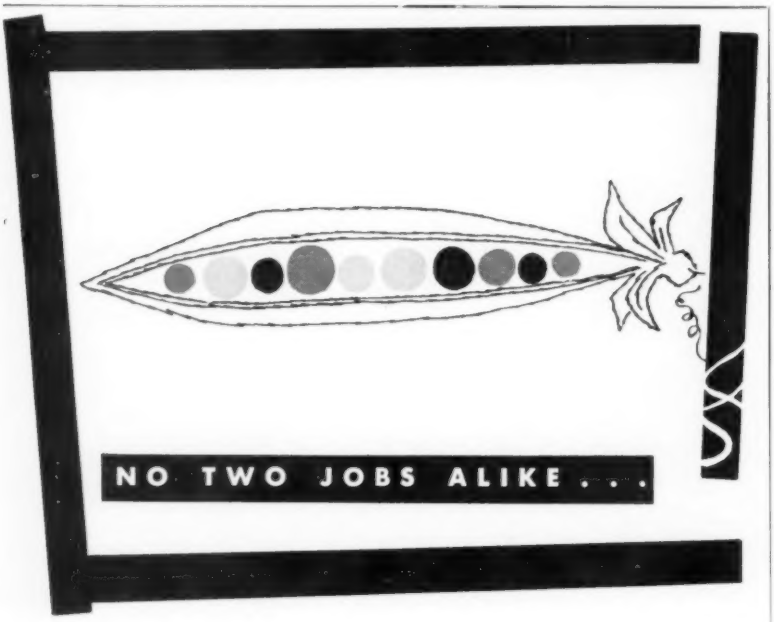
WENDELL GRIER is eastern sales representative for the ACF lubricated plug valve department. Mr. Grier, who will headquarter in Baltimore, will cover eastern Pennsylvania, Delaware, Maryland, Virginia, and southern New Jersey.

Kaiser Steel Corp., Oakland, Calif., has appointed WILFRED R. RIGGS JR. manager of the commercial research department and ROBERT H. HOWARD assistant to the director of general planning.

GEORGE T. NAFF, vice chairman of the board of Texas Eastern Transmission Corp., Houston, retired on April 30. Mr. Naff, who has been with the company virtually since it was founded in 1947 and served as president for almost three years, will serve as a consultant to Texas Eastern and others and engage in the private practice of law.

To meet increasing demands for pipeline and plant equipment in the Northwest, T. D. Williamson Inc., Tulsa, has appointed DON R. SHANNON as sales representative in Washington and Oregon. He will headquarter in Seattle.

Trans-Canada Pipe Lines Ltd. has appointed N. JOHN MCNEILL vice president and secretary and ROBERT C. BERRY vice president and treasurer. Formerly, the men were secretary and treasurer, respectively.



The successful completion of a Sheehan job — on time and on cost — is the result of careful planning and efficient operation by veterans in the construction of intermediary and connecting lines as well as the longer transmission lines . . . regardless of varying requirements for different jobs.

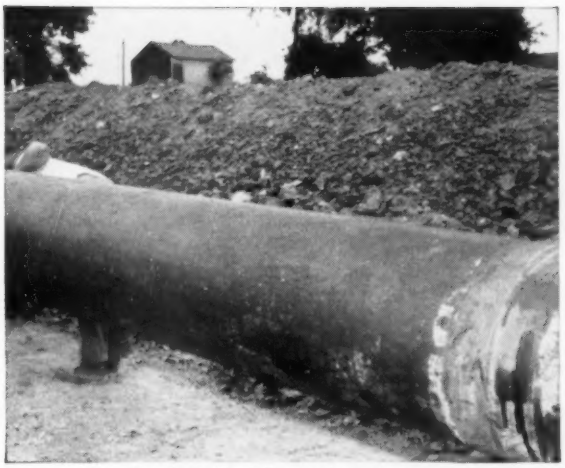
Sheehan "spreads" assure satisfaction simply through the use of the most modern and efficient methods, and through close attention to detail . . . every mile of the way.

Let Sheehan's experience work for you on your next pipe line project.

SHEEHAN PIPE LINE CONSTRUCTION CO. TULSA OKLA.

SHEEHAN

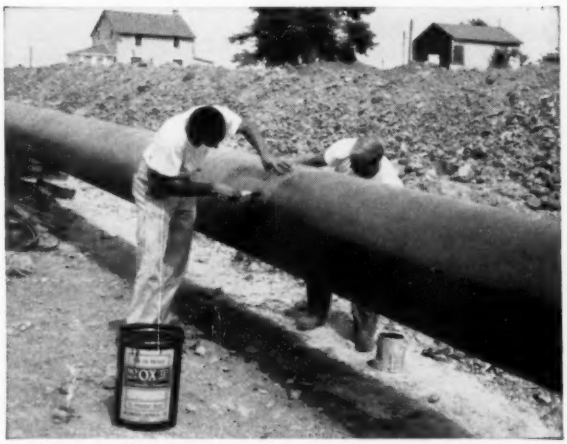
NATIONAL BANK OF TULSA BUILDING
TULSA, OKLAHOMA



Pipe, buried for 25 years, is good as new

Applying NO-OX-ID "GG" over the cleaned surface

Next, No. 4 NO-OX-IDized wrapper for protection against abrasion



Finally, NO-OX-ID Filler Red "C," a seal coat, completes protection

THIS PIPE IS 25 YEARS YOUNG

Twenty-five years ago NO-OX-ID combinations sealed this pipe against corrosion. Today, after two and one-half decades of uninterrupted service, the pipe is as good as new.

HOW DO WE KNOW THIS?

Recently, new construction made relocation of the line necessary. Inspection revealed the original NO-OX-ID coatings and wrappers had chemically and mechanically stopped moisture penetration and corrosive attack. *Not a foot of pipe was replaced.* After cleaning and a new application of NO-OX-ID coating-wrapper combination, the pipe was lowered in. It's now ready for many more years of additional service.

Many leading pipeline companies and utilities rely on NO-OX-ID combinations for lasting pipeline protection. Consult your Dearborn representative next time you move pipe or lay new lines for the right combination to meet your soil conditions.

NO-OX-ID ADVANTAGES

Coats more feet per man-hours because less material is needed • Applied hot or cold • By hand, by Traveliner or at the mill • Requires less equipment • No noxious fumes.

USE THIS COUPON FOR MORE INFORMATION

Dearborn NO-OX-ID®

For Long-Term Protection Against Pipe Corrosion

Dearborn Chemical Corporation
Dept. G, Merchandise Mart Plaza
Chicago 54, Illinois

Gentlemen:

☐ Have a Dearborn Pipeline Representative call
☐ Send me NO-OX-ID literature

Name.....*Title*.....
Company.....
Address.....
City.....*Zone*....*State*.....

— INDEX TO ADVERTISERS —

Aerotec Corp. 194
American Cast Iron Pipe Co. 45
American Liquid Gas Corp. 123
American Meter Co. 29, 103
American Recording Chart Co. 98
American Telephone & Telegraph Co. 189
Anchor Petroleum Co. 108
Anderson Co., V. D. 119
Aqua Survey & Instrument Co. 122

Badger Machine Co. 31
Barber-Greene Co. 50
Barrett Div., Allied Chemical & Dye Corp. 43
Barton Instrument Corp. 154
Baso Inc. 121
Beaird Co. Inc., J. B. ..... —
Berry Div., Oliver-Tyrone Corp. 139
Black, Sivalls & Bryson Inc. ..... Third Cover
Blaw-Knox Co. 193
Bonney Forge & Tool Works 94
Bristol Co. ..... —
Brooklyn Borough Gas Co. 122
Bucyrus-Erie Co. 109
Burgess-Manning Co. 180
Busada Manufacturing Co. ..... —

Case Co., J. I. 7
Cast Iron Pipe Research Assn. 4, 5
Chaplin-Fulton Mfg. Co. 10
Clark Bros. Co. 148, 149
Cleveland Trencher Co. 40
Connelly Inc. ..... —
Cooper-Bessemer Corp. 150, 151
Copon Associates ..... —
Crane Co. ..... —
Crose Mfg. Co., M. J. ..... —
Crutcher-Rolfs-Cummings Inc. 158
Cutler-Hammer Inc. ..... —

Darling Valve & Manufacturing Co. 185
Dearborn Chemical Co. 197
Dollinger Corp. 37
Dow Chemical Co. 25
Drake & Townsend Inc. ..... —
Dresser Industries, Inc. ..... —
Clark Bros. Co. 148, 149
Dresser Manufacturing Div. 49
Roots-Connersville Blower Div. 105
Duriron Co. Inc. ..... —

Earth Equipment Corp. ..... —
Eastman Chemical Products 32
Ebasco Services, Inc. ..... —
Edwards Inc., Allan ..... —
E-I-M Co. Inc. ..... —
Electro Rust-Proofing Corp. ..... —

Fish Engineering Corp. ..... —
Fisher Governor Co. 9, 18
Fisher Research Laboratories, Inc. ..... —
Foster Co., L. B. ..... —
Foxboro Co. ..... —

Garrett Oil Tools Inc. 155
GAS Subscription Order 106
General Controls 95
Goodrich Chemical Co., B. F. 41
Grabler Manufacturing Co. ..... —
Grayson Controls Div., Robertshaw-Fulton Controls Co. 87
Greenlee Tool Co. ..... —
Griffiths Co., E. F. 97
Grove Valve & Regulator Co. ..... —

Hallen Construction Co. Inc. 187
Hardwick Stove Co. ..... —
Hays Manufacturing Co. ..... —
Heath Survey Consultants Inc. 120
Hill, Hubbell & Co. 28
Homestead Valve & Manufacturing Co. ..... —
Houston Contracting Co. 190
Hydrauger Corp. ..... —

Ingersoll Rand Co. 147

Jaeger Machine Co. 39
Johns-Manville Corp. 181
Jones & Laughlin Steel Corp. 156

Kaiser Steel Corp. 124
Ka-Mo Tools Inc. 100
Koenig Iron Works Inc. 108
Koppers Co. Inc.—Tar Products 36

Lancaster Meter Parts Co. 106
Ledeen Manufacturing Co. 179
L.O.F. Glass Fibers Co. 191
Lone Star Steel Co. 3

Mack Iron Works Co. ..... —
Maloney Co., F. H. 183
Maxitrol Co. ..... —
McDonald Mfg. Co., A. Y. ..... —
Midwestern Pipe Line Products Co. 192
Mine Safety Appliances Co. 99
Minnesota Mining & Mfg. Co. 46
Motorola Communications & Electronics, Inc. 152
Mueller Co. 13, 14, 15

National Tank Co. 126
National Tube Div., U. S. Steel Corp. 48
Natural Gas Odorizing Div., Cue Fastener Corp. 38
Naugatuck Chemical Div. U. S. Rubber Co. ..... —
New England Forestry Service Inc. 118
Nordberg Manufacturing Co. 168, 169
Nordstrom Valve Div., Rockwell Manufacturing Co. 33, 34
Norton-McMurray Manufacturing Co. 111
Norwalk Valve Co. ..... —

Ohio Injector Co. 161
Oliver-Tyrone Corp., Berry Div. 139
Oronite Chemical Co. 20

Parsons Co. 93
Peerless Manufacturing Co. ..... —
Peerless Manufacturing Corp 108
Pennsylvania Salt Mfg. Co., Ind. Div. 47
Perfex Plastics Inc. 102
Perrault Equipment Co. ..... —
Philco Corp. 176, 177
Pipe Line Development Co. 104
Pittsburgh Coke & Chemical Co. ..... —
Pittsburgh Equitable Meter Div., Rockwell Manufacturing Co. Front Cover, 21 22 23 24
Pittsburgher Hotel 122
Polyken Products Div. Kendall Co. 26
Protecto-Wrap Co. ..... —

Quick-Wya Truck Shovel Co. ..... —

Radiator Specialty Co. 118
Radio Corp of America ..... —
Reed Manufacturing Co. ..... —
Reliance Regulator Div., American Meter Co. ..... Second Cover
Republic Steel Corp. 172, 173
Reynolds Gas Regulator Co. 101
Ridge Tool Co. 107
River Construction Corp. 166
Robertshaw-Fulton Controls, Co., Grayson Controls Div. 87
Rockwell Manufacturing Co.
Nordstrom Valve Div. 33, 34
Pittsburgh Equitable Meter Div. Front Cover, 21, 22, 23, 24
Roots-Connersville Blower Div., Dresser Industries, Inc. 105

Safety Gas Main Stopper Co. 101
Schield Bantam Co. 178
Shafer Valve Co. Inc. 144, 145
Sheehan Pipeline Construction Co. 196
Sinclair Oil & Gas Co. ..... —
Skinner Co., M. B. 35
Smith Corp., A. O. 164, 165
Somerville Construction Co. ..... —
Southern Cross Foresters ..... —
Sprague Meter Co. ..... Fourth Cover
Stafford Co., R. W. 122
Standard Electric Time Co. 1
Standard Magnesium Corp. 97
Standard Pipeprotection, Inc. 182
Superior Meter Co. ..... —

Tapecoat Co. 186
Taylor Forge & Pipe Works ..... —
Telsco Fittings Div. 119
Tennessee Gas Transmission Co. 163
Thermac Co. 91
Transcontinental Gas Pipe Line Corp 188
Tube Turns, Inc. ..... —
Tulsa Winch Div., Vickers Inc. ..... —

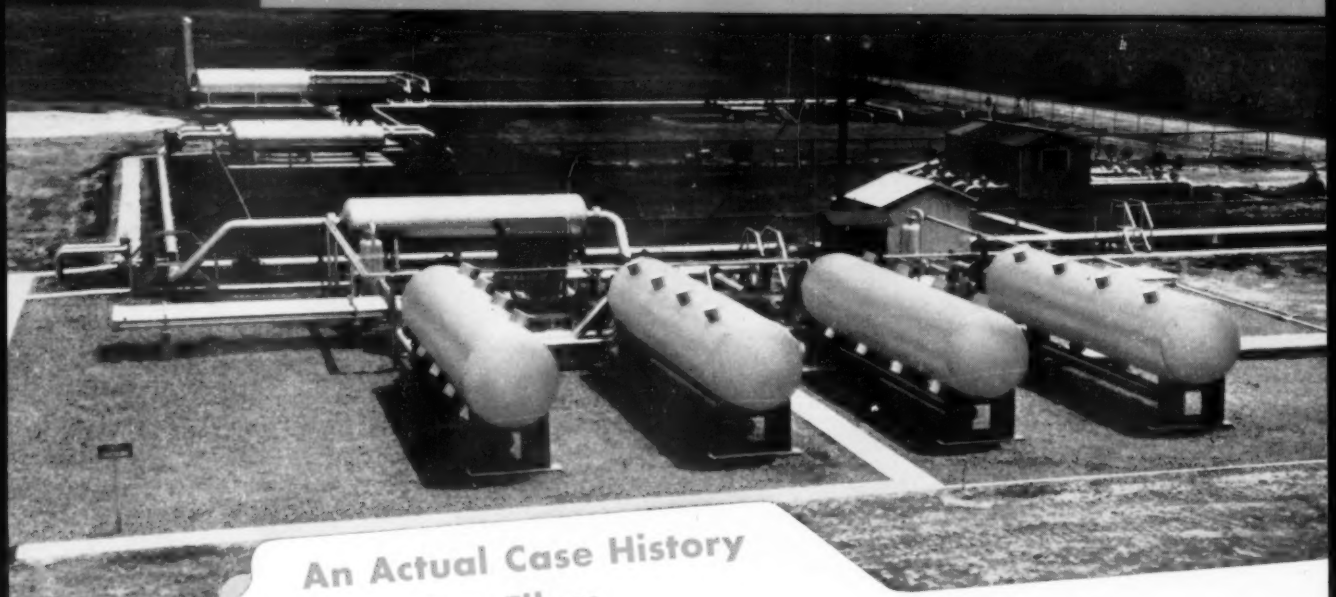
Union Malleable Mfg. Co. 30
United Engineers & Constructors 44
U. S. Pipe & Foundry Co. 16
U. S. Rubber Co. Naugatuck Chemical Div. ..... —
U. S. Steel Corp., National Tube Div. 48
Universal Controls Corp. 122

Vermeer Manufacturing Co. ..... —
Vulcan Rubber Products, Inc. 110

Wachs Co., E. H. 104
Warren Petroleum Corp. 118
Webster Engineering Co. 96
Williamson, Inc., T. D. 159
Willys Motors Inc. 42
W-K-M Mfg. Co., Inc. 143
Wood Co., John 103
Wood Industries Inc., Gar ..... —

Youngstown Sheet & Tube Co. 195

BS&B Dry Type Dehydrators Give Union Oil & Gas of Louisiana Up To 180 MMSCF of Dry Gas Sales Daily!



An Actual Case History From Our Files:

PROBLEM:

Continued gas sales by Union Oil & Gas of Louisiana to a pipeline company were in jeopardy because of undesirable moisture content in the gas. Suitable dehydration equipment was needed to continue this sale. Production was from Lake Arthur Field near Roanoke, La.

SOLUTION:

A BS&B Model DDH Dry Type Dehydrator with a rated capacity of 150 MMSCFD, and a 150 MMSCFD inlet scrubber, were installed. BS&B Automatic Controls were used throughout.

RESULT:

The operator is now delivering pipeline specification gas to the pipeline company at flow rates up to 180 MMSCFD. Pipeline company is pleased and has noted increase in existing capacity due to removal of water vapor. When asked about the operation of the equipment, the operator said, "It operates itself."

EFFICIENCY OVER 40 YEARS BS&B RELIABILITY

ANOTHER EXAMPLE OF PRODUCT LEADERSHIP

BLACK, SIVALLS & BRYSON, INC.

Oil & Gas Equipment Div., Dept. 1-BQ5

P.O. Box 1714

Oklahoma City, Oklahoma

it can't be measured or seen . .

but it can be proved . . .

that sustained accuracy in Sprague Gas Meters over extended periods of service with a minimum of maintenance is the rule. Such proven performance can be consistently achieved only when quality materials and fine workmanship are combined with simplified design to produce a product outstanding in its field.

THE Sprague METER COMPANY
BRIDGEPORT 4, CONNECTICUT

WESTERN BRANCH FACTORY — LOS ANGELES 23, CALIF. REGIONAL OFFICES — DAVENPORT, IOWA HOUSTON 3, TEXAS SAN FRANCISCO 11, CALIF.

Gas Meters of Simplified Design and Sustained Accuracy